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CIVIL RESERVE AIR FLEET LOAD PLANNING GUIDE BOEING 747

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OPR: HQ AMC/DOF (MSgt Gary Langford)
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This volume implements AFPD 24-2, Preparation and Movement of Air Force Materiel, and provides information needed to load plan a portion of the Civil Reserve Air Fleet (CRAF). Aircraft discussed in this volume is the wide-body Boeing 747. Provisions of this volume applies to Active Duty, National Guard, Military Reserve Units and other government agencies while utilizing commercial aircraft during contingencies.

This volume of AMCP 24-2 is intended for use as a load planning guide. Equipment listed is dimensionally compatible with all Boeing 747 aircraft and cargo areas discussed. Final approval of the procedures in this publication, however, ultimately rests with the individual contractor providing airlift services to the DoD. When new or additional information is received from the manufacturer, it will be provided as a change to this publication.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

The information contained herein is identical to the information in the previous pamphlet broken down into a more manageable file size. No data has changed. Users of this volume should print volume one which deals with the Administration, Policies, Specialized Loading Support Equipment, and Passenger, and Baggage Loading.

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1. General Description. The B747 is a wide-body aircraft flown by US and foreign airlines in passenger, and cargo configurations. The B747 is normally contracted to carry from 364-461 passengers or 180,000 pounds (90 tons) of cargo. The actual passenger or cargo maximum capability will vary based on series and individual aircraft configuration. For war planning, use 401 seats for passengers or troops and 90 tons for cargo. **Attachment 1** and **Attachment 2** along with AMCP 10-1403 list usable payloads based on distance flown. A brief description of the various models follows with specific data listed in **Figure 2.** through **Figure 29.**

Figure 1. BOEING 747

1.1. B747-100B, 200B and 400B: These are all passenger aircraft. (**Figure 4.** through **Figure 9.** show an example of typical 747 Passenger floor configurations.)

1.2. B747-100F, 200F and 400F: These are cargo aircraft with 33 or 37 pallet positions on the main deck. The 100F has a side cargo door. The 200F and 400F have a nose and side door. (**Figure 16.** through **Figure 18.** show an example of a typical 747F with nose and side door placements.)

2. Passenger Seating.

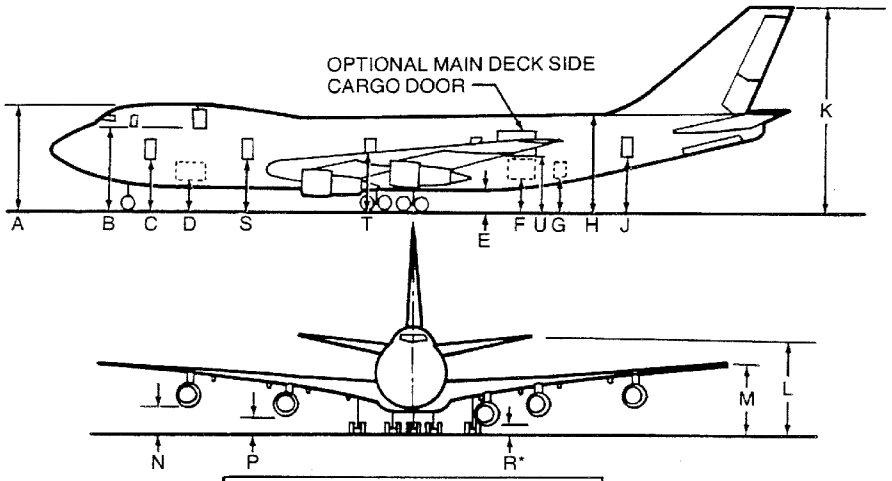
2.1. Passengers in Upper Level: The upper deck seating compartment aft of the crew compartment is basic on passenger aircraft. Seating capacity ranges from 0 (lounge) to 32 seats on United States

domestic aircraft. The seating compartment is optional on freighter versions and ranges from 3 to 19 seats in United States domestic aircraft.

2.2. Main Deck B747 Passenger Arrangement: The number of passenger seats available will vary by series of aircraft, carrier spacing of seats, and contract requirements. A general planning factor is 360 seats for peacetime operations or 340 during CRAF activation on the passenger B747s. The contract seating for the B747 normally is 390 or 461, depending on configuration, even though fewer or more seats may be available on carrier-specific aircraft. During CRAF activation **Figure 4.** through **Figure 7.** gives typical seating arrangements that may be seen on CRAF B747 aircraft.

NOTE: Loading more than 461 troops may exceed the GACL and limit aircraft range.

Figure 2. External Ground Clearances, Passenger Configurations.



	VERTICAL CLEARANCES**			
	MINIMUM		MAXIMUM	
	FT-IN.	M	FT-IN.	M
A	31-10	9.70	34-1	10.39
B	24-10	7.57	27-5	8.36
C	15-3	4.65	17-7	5.36
D	8-8	2.64	10-8	3.25
E	6-3	1.88	6-9	2.08
F	8-10	2.69	10-4	3.15
G	9-6	2.90	11-4	3.46
H	28-6	8.70	31-0	9.43
J	15-0	4.57	17-6	5.33
K	60-2	18.34	64-3	19.58
L	27-0	8.23	30-8	9.35
M	17-7	5.36	19-2	5.84
N	6-0	1.82	7-0	2.13
P	3-9	1.14	4-6	1.37
N	4-11	1.50	6-4	1.93
P	2-7	0.79	3-10	1.17
R*	2-4	0.71	3-0	0.91
S	15-8	4.78	17-2	5.23
T	15-8	4.78	16-7	5.06
U	15-4	4.67	17-6	5.33

747-200B WITH JT9D-70A ENGINES

-100, -200 Series

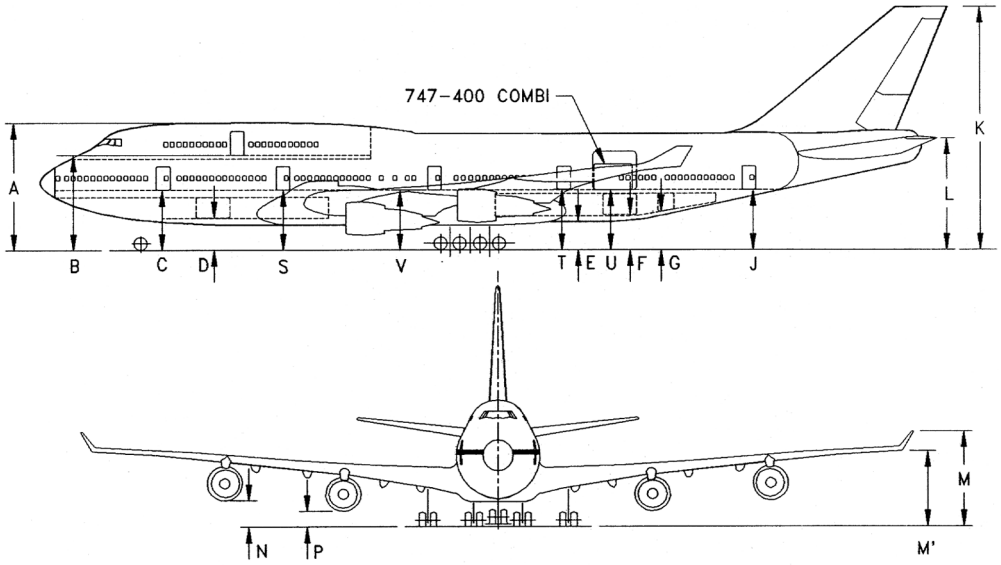
*DENOTES GROUND CLEARANCE OF BUILT-UP POWER PACKAGE WHEN CARRIED AS SPARE.

**VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING/UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

GROUND CLEARANCES—PASSENGER CONFIGURATIONS
MODELS 747-100B, -200B, -200C

Figure 3. Ground Clearance 747-400 (Passenger and Freight).



	MINIMUM		MAXIMUM	
	FT - IN	M	FT - IN	M
A	32 - 1	9.80	33 - 6	10.23
B	24 - 8	7.53	25 - 11	7.91
C	15 - 6	4.74	16 - 11	5.18
D	8 - 10	2.71	10 - 2	3.11
E	6 - 10	2.09	7 - 11	2.42
F	9 - 3	2.82	10 - 5	3.18
G	9 - 10	3.00	11 - 2	3.41
H	29 - 7	9.02	31 - 4	9.56
J	15 - 9	4.82	17 - 5	5.33
K	61 - 7	18.80	64 - 0	19.51
L	27 - 6	8.39	29 - 9	9.09
M	16 - 9	5.11	18 - 8	5.70
M'	17 - 2	5.24	19 - 1	5.84
N	4 - 4	1.32	5 - 10	1.80
P	2 - 3	0.71	3 - 0	0.93
S	15 - 9	4.80	16 - 10	5.15
T	16 - 0	4.88	17 - 0	5.19
U	16 - 0	4.88	17 - 3	5.28
V	15 - 11	4.87	16 - 9	5.11

NOTES: VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

GROUND CLEARANCES
MODEL 747-400, -400COMBI

-400 Series

Figure 4. Interior Arrangement, Economy Passenger Seating.

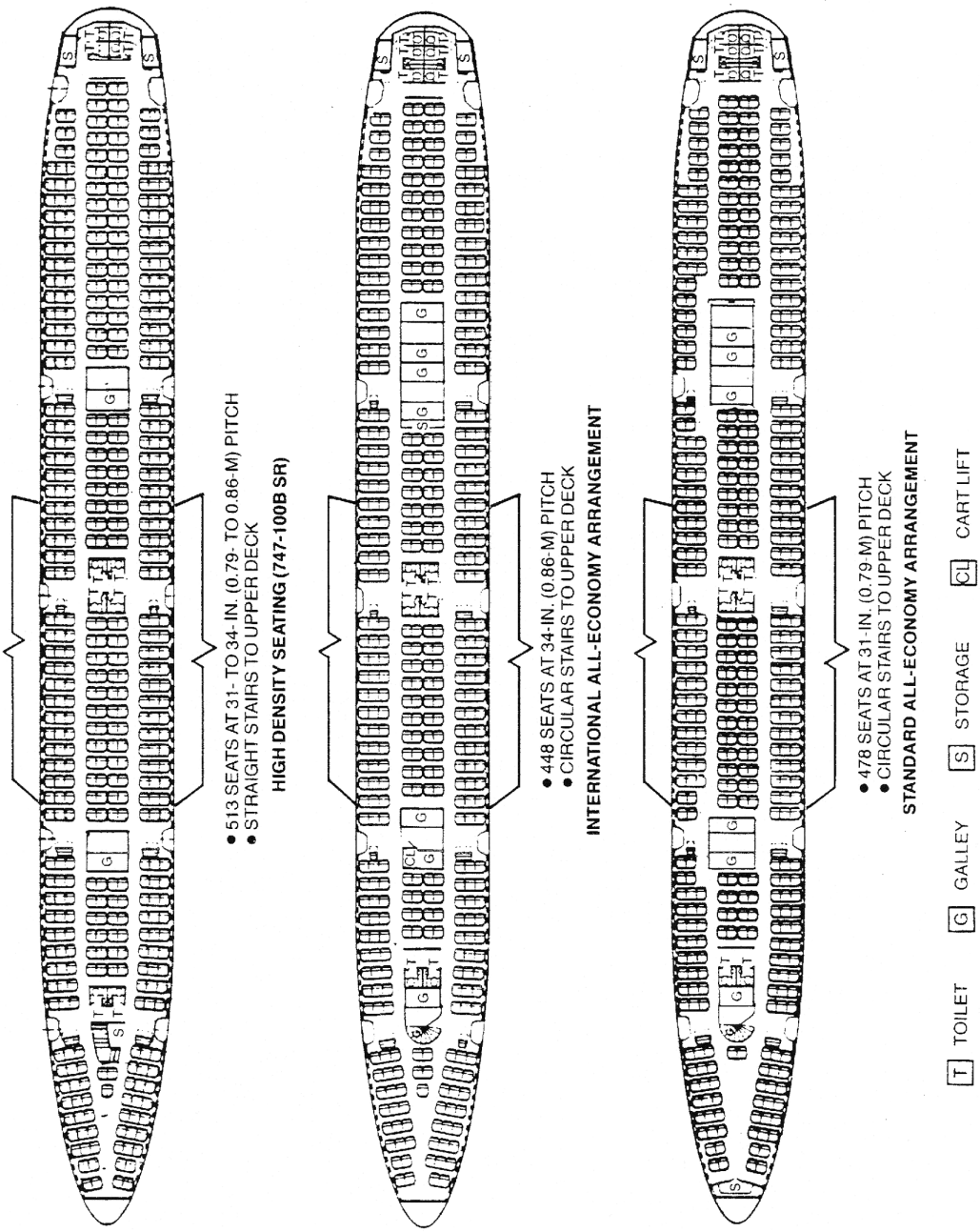
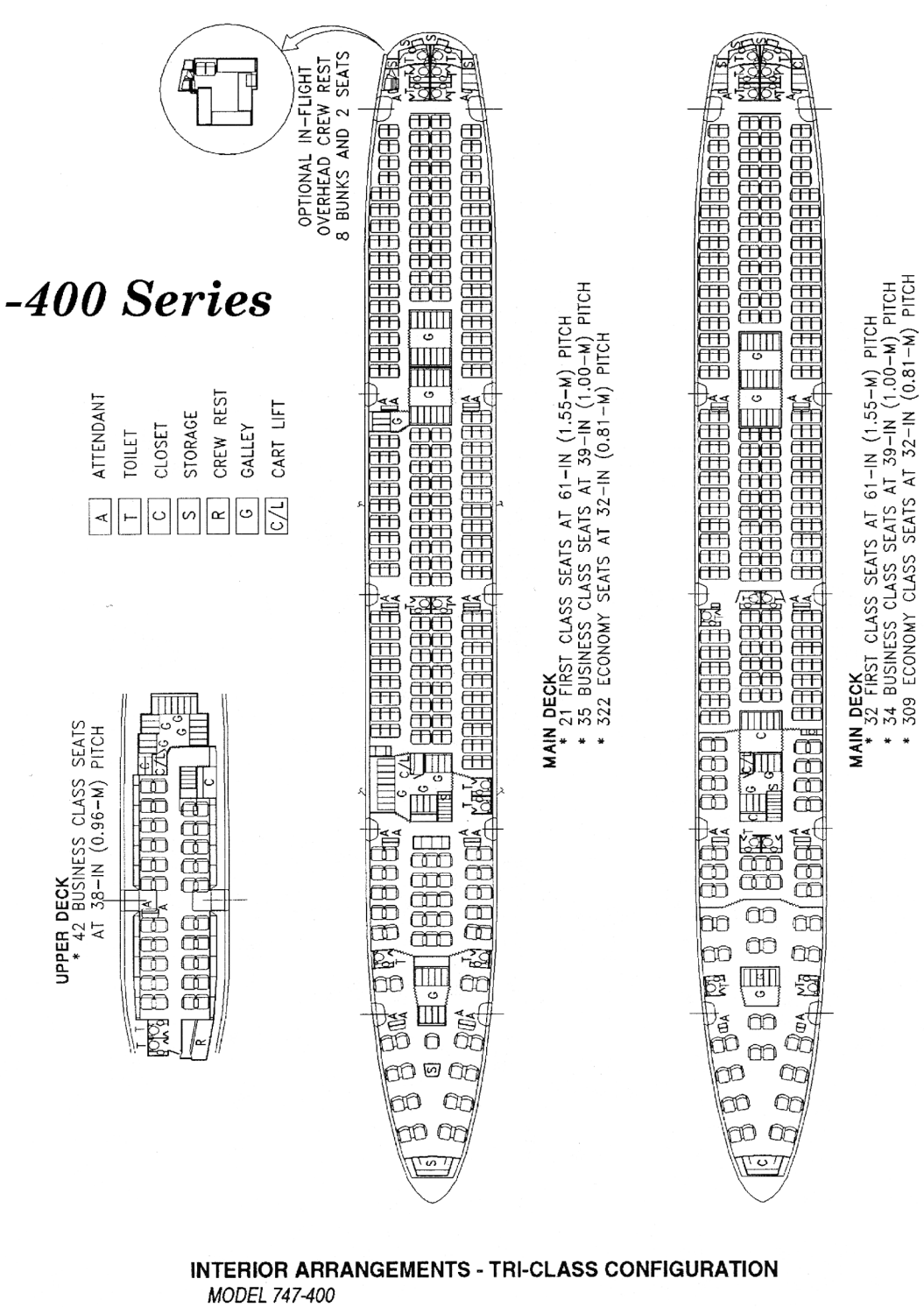
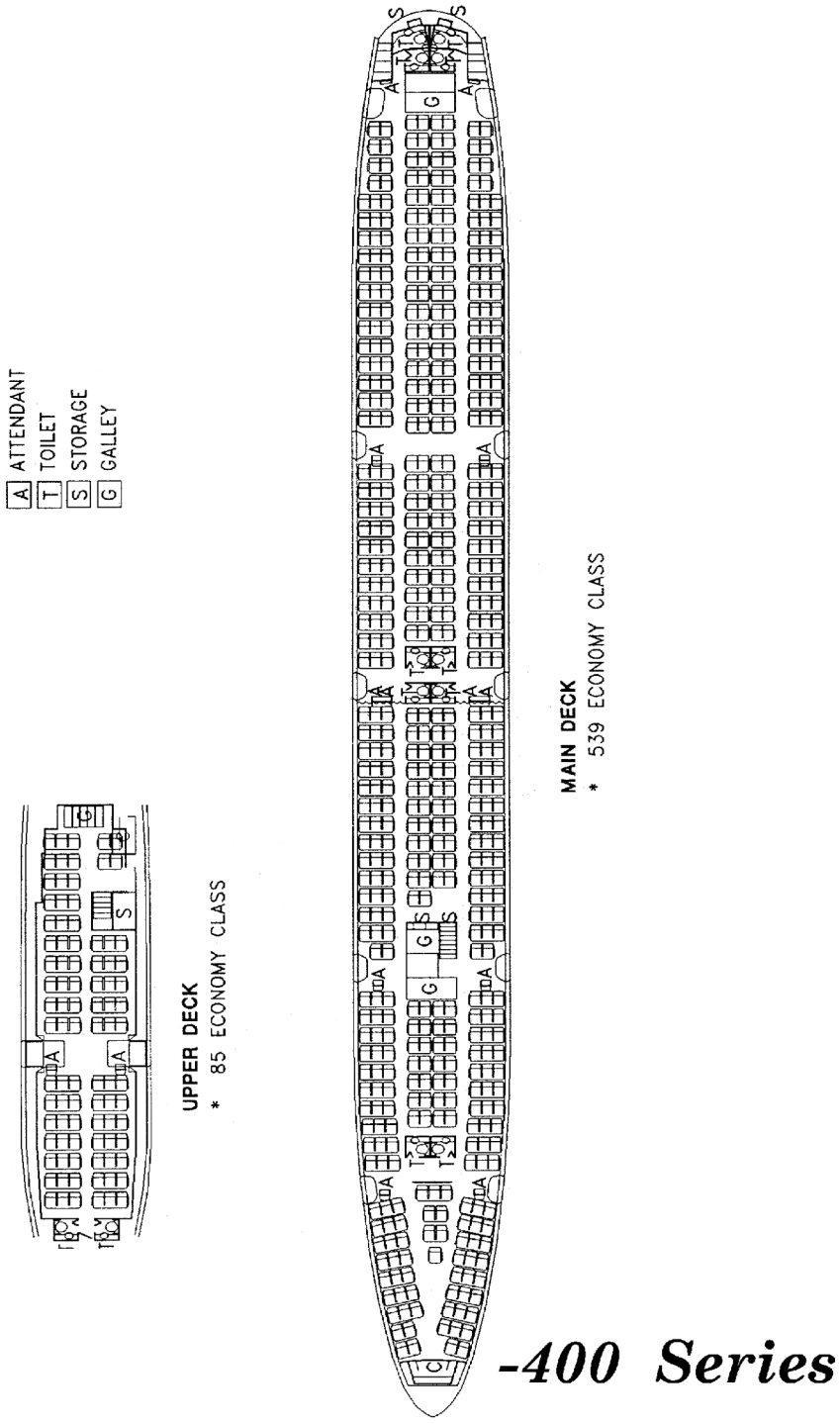


Figure 5. Interior Arrangement, Tri-Class Passenger Configurations.



INTERIOR ARRANGEMENTS - TRI-CLASS CONFIGURATION
MODEL 747-400

Figure 6. Interior Arrangement, High Density Passenger Seating.



INTERIOR ARRANGEMENTS - HIGH-DENSITY SEATING CONFIGURATION
MODEL 747-400

Figure 7. Interior Arrangement, Upper Deck Passenger Seating.

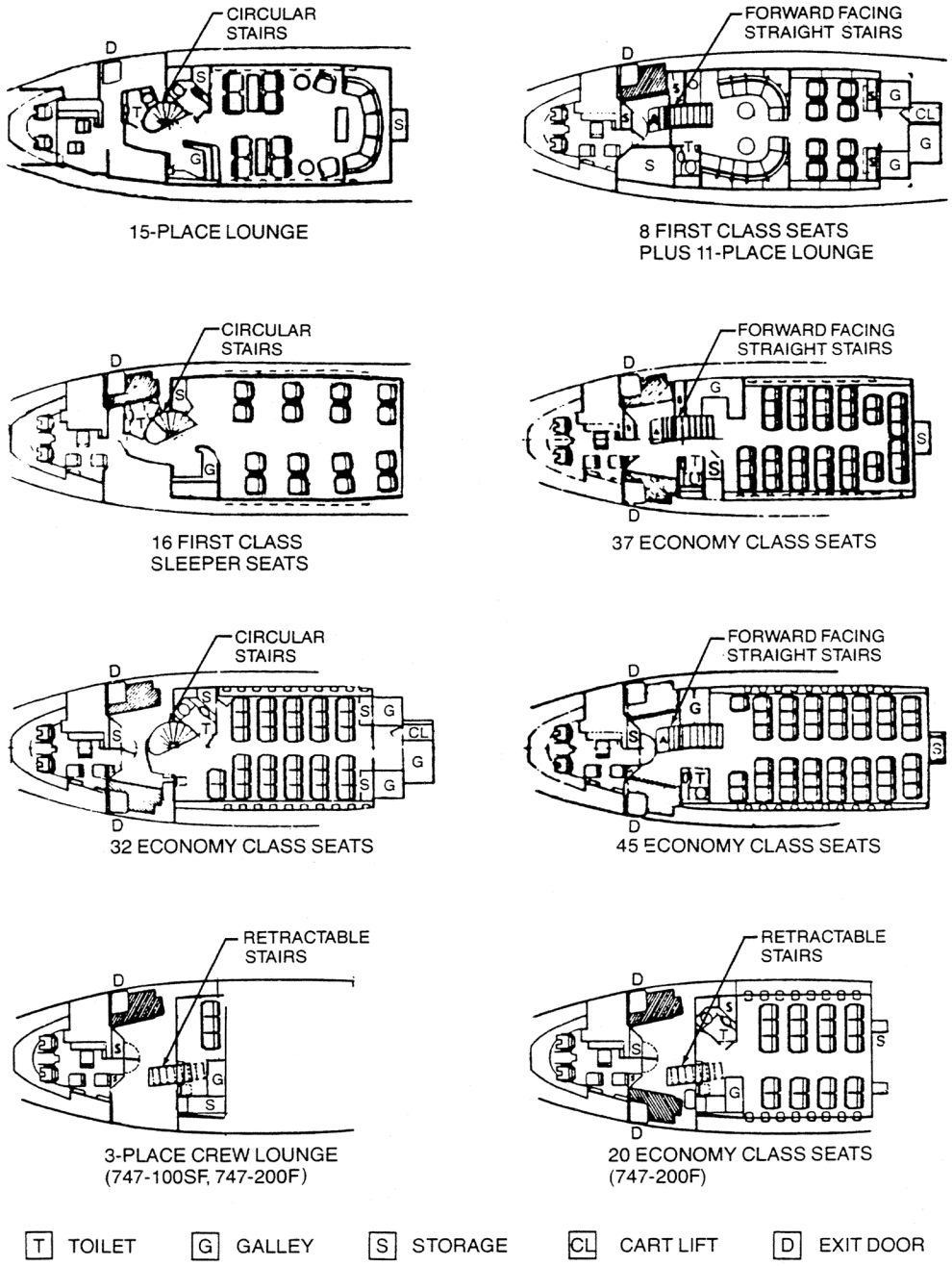
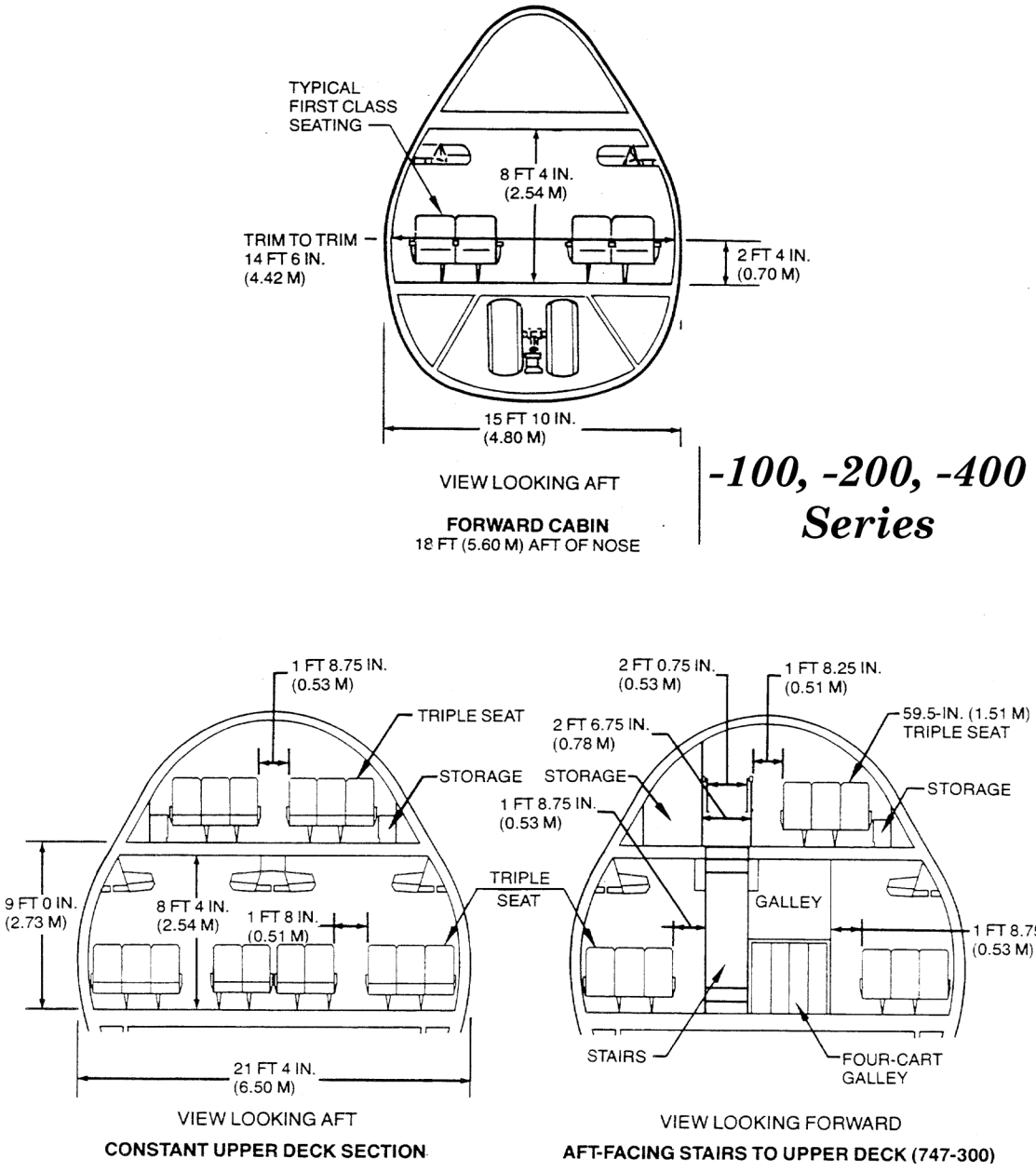
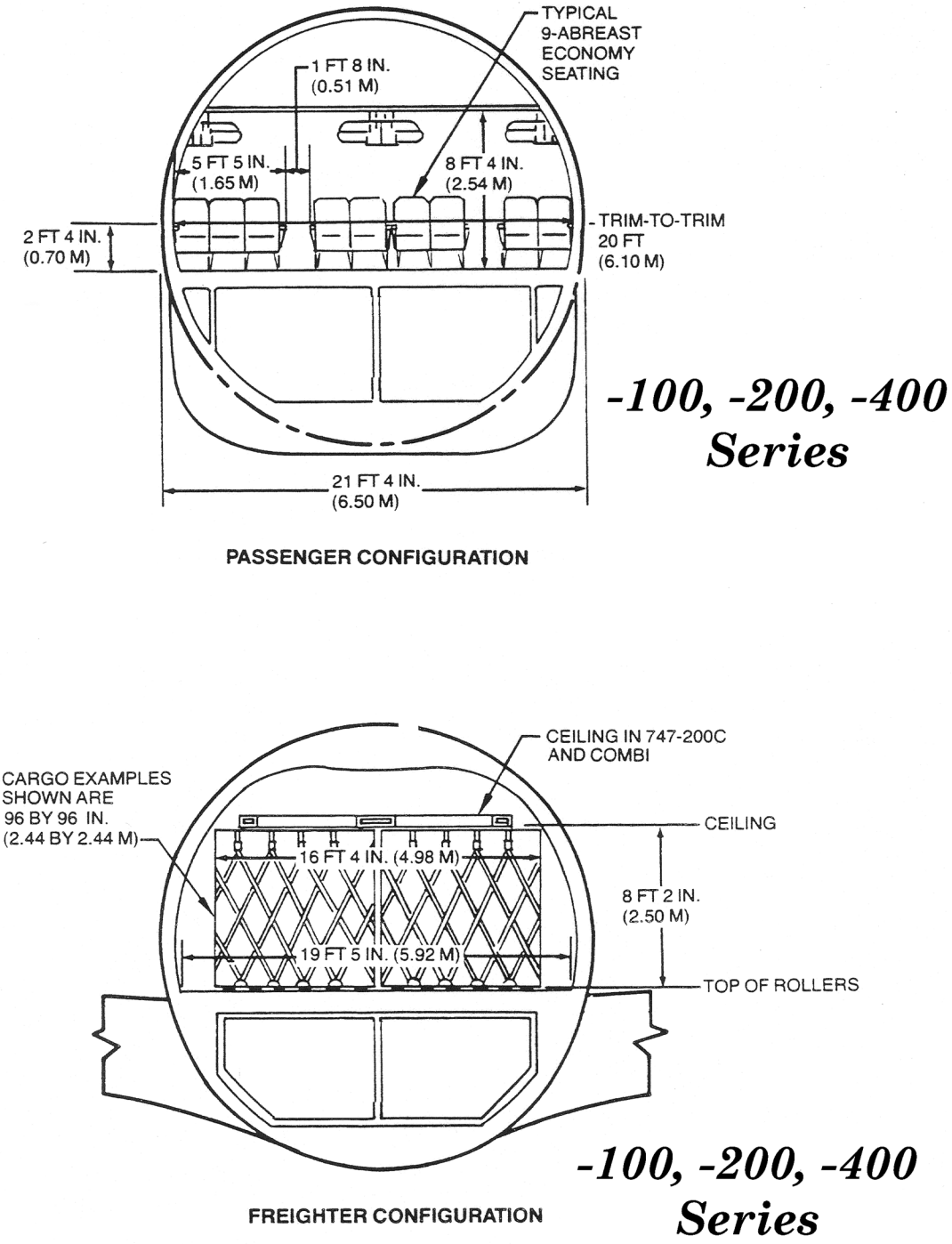


Figure 8. Passenger Seating, Upper and Lower Deck Cross Section, All Models.



CABIN CROSS SECTIONS — FORWARD CABIN
MODEL 747

Figure 9. Passenger Seating, Main Deck Cross Section.



3. Maximum Payload. The maximum payload is computed without regard to cargo density and is limited only by aircraft structural limitations or fuel requirements for a specific range. The maximum struc-

tural payload for each series B747 can be found in **Table 2.** and range-payload information is presented in **Attachment 1**.

4. Cargo Door Dimensions and Cargo Restrictions. The presence of a nose (visor) door and a side door will vary according to series and individual carriers options.

4.1. Nose (Visor) Cargo Door. The nose door entrance is 104 inches wide by 98 inches high (**Figure 24.**). However, due to the need for a subfloor (463L pallets) and a recommended 2-inch top clearance, 94 inches is the maximum height of military cargo that can be loaded through the nose. The maximum width of cargo that can be loaded varies according to its height. **Figure 22.**and **Figure 24.** can be used to determine the loadability of oversize equipment. An M-113 armored personnel carrier (APC) has been successfully loaded and is considered one of the largest pieces of equipment that may be loaded through the nose of the B747. Nose door loading or unloading is the faster method of loading for cargo 94 inches high or less. (See paragraph **5.** (**Table 2.**) for sample compatible cargo.)

NOTE: **When loading equipment through the nose door that exceeds the 88-inch pallet width, additional shoring is required to act as a subfloor.**

4.2. Side Cargo Door. The side cargo door is located on the left aft section of the fuselage of the B747 and is 134 inches wide by 123 inches high. However, due to the need for a subfloor (463L pallets) and a recommended 2-inch top clearance, 119 inches is the maximum height of military cargo that can be loaded through the side door. Cargo 119 inches high or less may be loaded on the main deck aft of FS 903 using this door; ***EXCEPTION:*** Some 747s that were passenger equipped, but converted to the "all Freighter" version may have a 94' height limit. Cargo forward of FS 903 is restricted to 94 inches in height due to the overhead crew and passenger compartment. Equipment width and length are interrelated in determining loadability of cargo through the side door. The maximum package chart (**Table 3.**) is provided for general planning purpose to determine probable equipment loadability. Actual equipment lengths may be increased based on narrower widths near the top of rolling stock which would permit loading of the cargo using the forward-back rotate method of loading.

5. Compatible Cargo. Examples of some of the larger pieces of equipment that can be loaded are listed below. Transporting these items is subject to carrier approval, and users are advised to contact the specific carrier for guidance.

Table 1. 747 Sample of Compatible Cargo.

Vehicle	**Side Door**	**Front Door**	
Nomenclature	**(119 Inches Max Ht)**	**(94 Inches Max Ht)**	**FLL**
Type	*M35A2	M36A2	
Description	2-1/2 ton truck	2-1/2 ton truck x-long	
Conf	Reduced air	Reduced air	
LxWxH	270" x 96" x 92"	329" x 95" x 81"	
Weight	13,570 pounds	14,876 pounds	
	(16,060 maximum weight)		
Type	M113	M113	M416
Description	Armored psnl carrier	Armored psnl carrier	1/4 ton trailer
Conf	Operational	Reduced air	Operational
LxWxH	192" x 106" x 99"	192" x 100" x 84"	109" x 62" x 53"
Weight	18,940 pounds	18,811 pounds	1,080 pounds
		Less the weight of machine gun and mount	Loaded with components of an AN/MRC-119
Type	M730		Bulk cargo
Description	Chaparral		Palletized
Conf	Operational		
LxWxH	230" x 106" x 105"		62" or less in height
Weight	14,783 pounds		
*M-35A2 2-1/2 ton truck configuration is with front window up (92 inches high) and side rails installed (87 inches high). This configuration permits a 6-inch arc between side rails and fuselage when vehicles are loaded side by side. Vehicle also can be loaded through the nose door in this configuration.			

6. Main Deck Pallet Configuration. Due to floor limitations, all military cargo on the main deck must be palletized or on a palletized or shored subfloor. Normally, the subfloor consists of standard 463L pallets; shoring consists of wood at least 2 inches thick. The main deck of the B747 can be configured for a 33 or 37 pallet configuration (**Figure 12.**), however the 37 pallet configuration can only be used for loads made up entirely of palletized cargo. While loading of the aircraft with 37 pallets using the recommended loading crews in paragraph **12.** can be accomplished within the allotted ground times (See AMCP 24-2 Volume I, paragraph 2.7), this configuration presents several significant problems in the actual upload and download of the aircraft. Due to the extremely close pallet clearances, the configuration may create problems with pallet binding, increased loading times, increased manpower, and a potential for safety mishaps. These factors must be considered when determining which configuration will be used for specific missions. The 33 pallet configuration is required for mixed loads or loads made up entirely of rolling

stock. Shoring is required in the 15- inch gap between the two rows of pallets in this configuration when loading rolling stock (**Figure 14.**). The following is a suggested procedure for installing a 463L pallet subfloor onto the main deck of a B747. The same general procedures can be used for other aircraft in the civil fleet. Due to aircraft floor weight-bearing limitations, equipment that comes in contact with the floor may damage the floor.

6.1. Side Door Loading with 33 Pallet Configuration:

6.1.1. Ensure fore and aft end locks are spaced 109 inches (center to center). A proven technique to space the end locks at the proper interval is to cut a 2- X 4-inch length of wood or other measuring stick to a length of 108 inches, and use this between successive end locks. The 1-inch thickness of the end lock results in the lock being spaced 109 inches center to center.

6.1.1.1. Start fore and aft end lock spacing at forward edge of side door (FS 1784). Area may be marked on floor.

6.1.1.2. Space locks 109 inches apart (center to center) with last lock at FS 584.

6.1.1.3. Space locks 109 inches apart (center to center) aft from FS 1783, with last lock at FS 2218.

6.1.1.4. Space locks for pallet positions 1, 2, and 33 as marked on floor of aircraft.

6.1.2. Install 27 pallets, leaving pallet positions 13, 14, 15, 28, 29, and 30 open if slave method of loading is used. Install entire 33 pallets if drive-on method of loading is used.

6.2. Nose Door Loading with 33 Pallet Configuration:

6.2.1. Ensure fore and aft locks are spaced 109 inches apart (center to center) using the same method as for side door loading.

6.2.2. Install 31 pallets. Leave pallet positions 1 and 2 open for slave pallet method of loading. This is the recommended method of loading through the nose door. The drive-on method of loading would require 2-inch shoring from the nose door to FS 584.

7. Pallet Limitations:

7.1. Pallet Weights. The cargo floor weight limitations of the B747 vary not only by series but also by the carrier's needs when that particular aircraft was ordered from the manufacturer. Although maximum floor limits cannot be given for every aircraft, general limitations are provided in **Figure 14.** and **Figure 15.** However, the specific carrier under contract to HQ AMC is the final approving authority for contracted loads.

7.2. Pallets Heights. All pallets loaded in the lower lobes are limited to 62 inches, measured from the top of the pallet. Paragraph **4.** has additional cargo height restrictions.

8. Lower Lobe Compartments. The lower lobe has three sections (**Figure 17.** and **Figure 18.** and **Table 6.** through **Table 9.**). The forward lower lobe (FLL) can carry up to five military or commercial pallets. The center lower lobe (CLL) (also referred to as the aft lower lobe) can carry four military or commercial pallets. The aft bulk compartment (ABC), separated by a removable curtain from the CLL, can carry 800 cubic feet of bulk cargo. The maximum height of equipment loaded into the FLL or CLL is 62 inches measured from the top of the pallet. All cargo must be palletized, put on a 463L pallet subfloor, or containerized.

WARNING: No hazardous cargo or equipment will be placed in the center lower lobe or aft bulk compartment due to inaccessibility of the compartment during flight.

8.1. Forward Lower Lobe. The FLL of the B747 has an open floor. If baggage is bulk loaded into this compartment, up to 3,485 cubic feet are available. If baggage pallets are placed into this compartment, each pallet is limited to 313 cubic feet.

8.2. Center Lower Lobe. The CLL of the B747 has an open floor with aircraft ribs exposed. There are 3,015 cubic feet of total space available for baggage if bulk loaded. If baggage is palletized, each pallet is limited to 313 cubic feet of space.

8.3. Aft Bulk Compartment. The ABC of the B747 has a solid subfloor that slants up toward the tail of the fuselage. It can hold 800 cubic feet of baggage; however, this compartment is normally used by the carrier for spare parts kits, wheels, crew baggage, etc.

8.4. Lower Lobe Restraints. The lower lobes normally have rails ready to accept a 125-inch commercial pallet. If hardware is not available to convert the rails to accept a 108-inch military pallet, straps must be used to provide lateral restraint. Standard 88-inch end locks provide forward or aft and vertical restraint. Provide the lateral restraint by attaching a strap to each corner ring on the right side of the pallet and attach the other end to the left rail.

9. Loading Sequence:

9.1. The front of a B747 should be loaded first to prevent the possibility of the aircraft tipping, or settling on its tail. Suggested procedure is to load the FLL first while the subfloor is being installed. Then, on side door loading, start loading the nose area working toward the aft, and then finally moving into the CLL and ABC once the main deck has been partially loaded. For nose door loading, equipment must be loaded into the FLL or placed forward of FS 1407 before the loading of the main deck aft of FS 1407 is complete.

9.2. In most B747s, a CG alarm system will sound an audible alarm if the CG of 38% is exceeded. Should the alarm sound, the drive system in the main deck is deactivated. In critical situations, the CG can be continuously monitored on the second officer's panel. In general, loads forward of FS 1403 (44.2 percent MAC) will prevent tipping and loads aft of FS 1403 will increase the probability of tipping.

10. General Rules. Aside from this preferred loading sequence, the following general rules must be complied with when loading B747s:

10.1. All cargo must be loaded over and placed on a subfloor, preferably military pallets.

10.2. Wooden shoring at least 2 inches thick or a double layer of 3/4-inch plywood should be used in between pallets in the aisles or as a subfloor if this area is used.

10.3. Contracts normally specify a guaranteed ACL of 180,000 pounds for the entire load, including main deck cargo, lower lobe cargo, passengers, and subfloor.

10.4. ACL includes pallet subfloor weights figured at 355 pounds per pallet.

10.5. A wide-body elevator loader is needed to load the main deck.

10.6. Cargo listed in paragraph **5.** represent a sample of largest practical items that can be loaded without the need for complex shoring.

10.7. Vehicle axles and cargo must be located IAW weight and balance limitation provided by Boeing and are available from HQ AMC/DOF.

WARNING: Do not place hazardous cargo in the CLL or ABC due to inaccessibility to the compartment during flight.

11. Tie-Down Equipment. For general planning purposes, the following tie-down equipment should be available for B747 cargo aircraft:

Load of Light Vehicles and Trailers	**Load of Medium to Heavy Vehicles**
250 Straps (5,000 pounds)	150 Straps (5,000 pounds)
250 Devices (10,000 pounds)	100 Devices (10,000 pounds)
250 Chains (10,000 pounds)	100 Chains (10,000 pounds)

12. Loading Times and Crews. (See AMCP 24-2 Volume I, paragraph 2.7. for contract aircraft load times.) Typical loading times vary greatly depending on the experience of the crew loading the B747. In general, the following can be used as a guideline based on two seven-member loading crews, one working the lower lobes and one working the main deck:

Reconfigure main deck pallet locks (as required)	55 minutes to 1 hour and 5 minutes
Install main deck subfloor	40 minutes to 1 hour and 5 minutes
Nose door loading of main deck with rolling stock	2 hours to 2 hours and 30 minutes
Side door loading of main deck with rolling stock	2 hours and 45 minutes to 3 hoursand 15 minutes
Lower lobe loading with rolling stock and bulk cargo	1 hour to 1 hour and 45 minutes
Hand loading lower lobe with baggage	50 minutes to 1 hour and 30 minutes

13. Fuselage Cross Sections. **Figure 19.** through **Figure 22.** illustrate body frame envelopes and do not necessarily represent usable volumes. For **Figure 23.** the cross sections for main deck stations 902-2,000 will vary with cumulative line number.

14. Load Planning. Detailed load planning of the B747 is very complicated and requires weight and balance expertise made available by the applicable carrier's operation center. Contact HQ AMC/DOF for the current telephone listing of specific commercial carrier operations centers under contract for providing airlift services to AMC headquarters.

Figure 10. General Information, Dimensions etc.

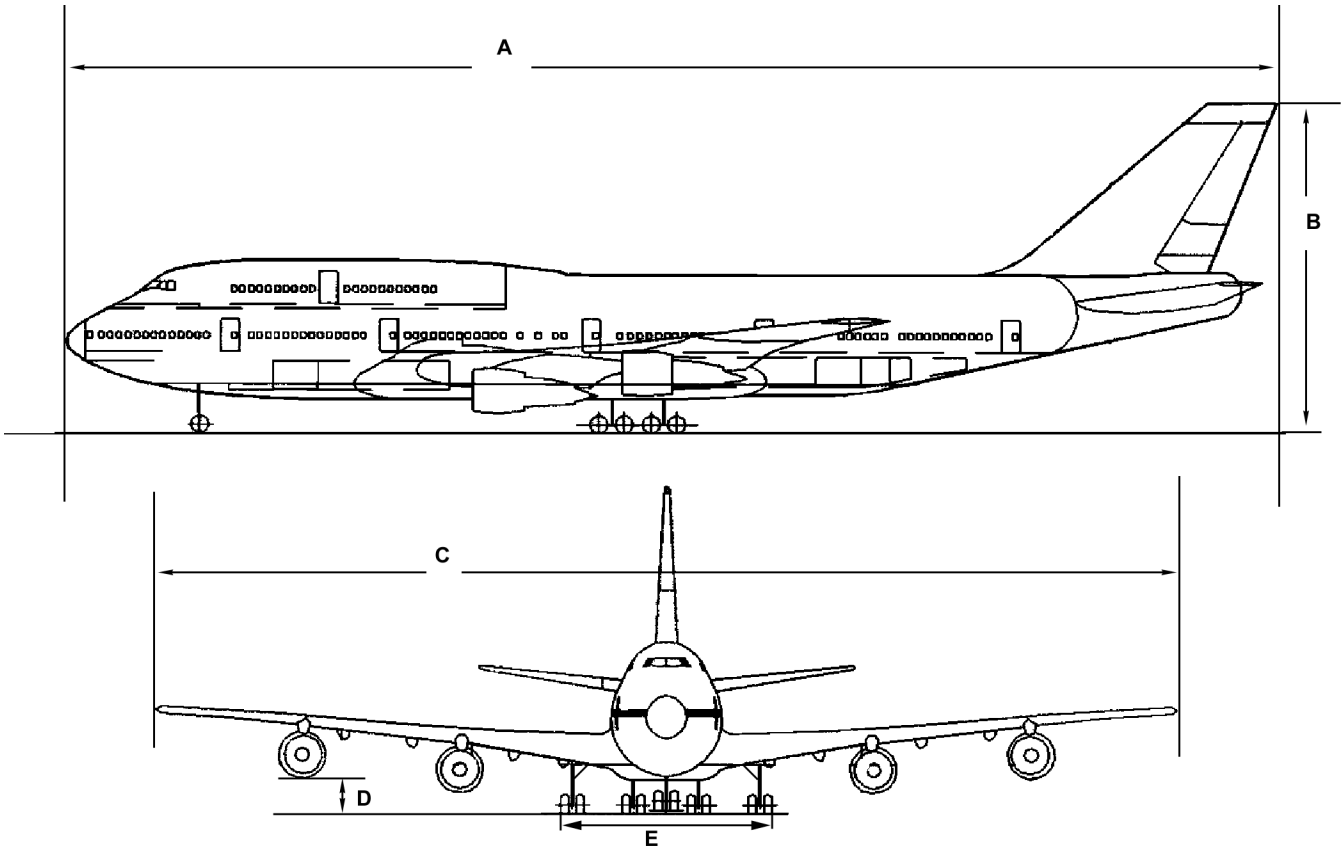


Table 2. B747 General Information, Dimensions and Misc.

Aircraft	A	B	C	D /1	E
B-747-100B	231’ 10”	62’ 7”	195’ 8”	6’ 0”	39’ 9”
B-747-100F	231’ 10”	62’ 7”	195’ 8”	6’ 0”	39’ 9”
B-747-200B	231’ 10”	62’ 7”	195’ 8”	6’ 0”	39’ 9”
B-747-200F	231’ 10”	62’ 7”	195’ 8”	6’ 0”	39’ 9”
B-747-300F	231’ 0	62’ 7”	62’ 7”	6’ 0”	39’ 9”
B-747-400B	231’ 0”	62’ 7”	62’ 7”	6’ 0”	39’ 9”
B-747-400F	231’ 0”	62’ 7”	213’ 0”	6’ 0”	39’ 9”

Aircraft	Turning Radius /2	Rwy /3 180º Turn	Min /4 Rwy Width	Min /4 Taxi Width	Fuel /5 Gal/Hr.	Block /5 Speed
B-747-100B	146’ 0”	142’ 0”	90’ 0”	75’ 0”	3880	465

Aircraft	Turning Radius /2	Rwy /3 180° Turn	Min /4 Rwy Width	Min /4 Taxi Width	Fuel /5 Gal/Hr.	Block /5 Speed
B-747-100F	146’ 0”	142’ 0”	90’ 0”	75’ 0”	3880	465
B-747-200B	146’ 0”	142’ 0”	90’ 0”	75’ 0”	3880	465
B-747-200F	146’ 0”	142’ 0”	90’ 0”	75’ 0”	3880	465
B-747-300F	155’ 0”	153’ 0”	90’ 0”	75’ 0”	3880	475
B-747-400B	155’ 0”	153’ 0”	90’ 0”	75’ 0”	3880	475
B-747-400F	155’ 0”	153’ 0”	90’ 0”	75’ 0”	3880	475
	Design Weights:					
Aircraft	**Max T/O**	**Max Land**	**Zero Fuel**	**Operating**	**Max /6 Payload**	**Contract ACL/PAX**
B-747-100B	750K	585K	526K	375K /11	75.5K	360 PAX
B-747-100F	750K	575K	545K	327K	107K	90 S/T
B-747-200B	775K-883K	564K	526K	382K /11	72K	360 PAX
B-747-200F	775K-883K	630K	590K	349K	121-124K	90 S/T
B-747-300F	875K	645K	600K	400K	235K	90 S/T
B-747-400B	875K	630K	535K	417K	118K	360 PAX
B-747-400F	875K	660K	610-635K	353K	259-282K	90 S/T

		Pallets:			
Aircraft	**Seats /7**	**Mil 88x108**	**Commercial**	**LCN /1**	**Gear Type**
B-747-100B	365	------	------	87	DDT
B-747-100F	2 /10	33	29	87	DDT
B-747-200B	349-450	------	------	86	DDT
B-747-200F	2 /10	33	28-14	90	DDT
B-747-300F	2 /10	------	------	95	DDT
B-747-400B	372	------	------	95	DDT
B-747-400F	2 /10	33	28-14	95	DDT

NOTES:

[1] Based on maximum taxi weight

[2] From pivot point of aircraft to most distant point on fuselage/wing.

[3] Based on distance needed for wheels to remain on runway for a 180° turn.

[4] To be used as guide only. Individual carrier will make final determination.

[5] Based on a 3500 NM leg.

[6] Maximum payload is based on aircraft structural payload. See **Attachment 1** for range payloads.

[7] Numbers are for typical seating arrangements. See para. 5.2 for passenger planning factors.

[8] Data for the -100 MOD C and -200C/MOD C are given for the cargo configuration only. For planning purposes, the aircraft will be used in this configuration.

[9] The number listed is for main deck only. With the exception of the B747SP an and a few B747-100s (with lower galley), all other aircraft have nine pallet positions (both mil and civ) in the lower bays (five FLL, four CLL).

[10] Upper deck seating capacity for C/F versions range from 3-32. Users should plan on using only two seats.

[11] Removal of passenger accommodations and installation of the bulk cargo configuration M-1 kit will reduce the operating weight by 10,500 lbs.

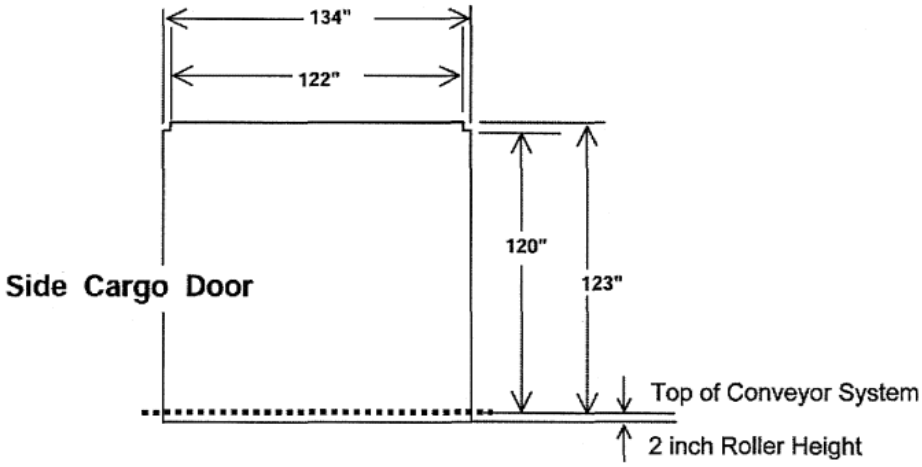
[12] Twenty-six pallets for B747-200 MOD C.

[13] B747-200F Aircraft possess a 29 main deck pallet capability. Consult appropriate carrier for their specific capability

Table 3. 747 Maximum Package Chart, Side Doors Only.

SIDE Cargo Door MAX height calculations:

Door Height:	123.00
Pallet Height (minus)	- 2.25
Top Clearance (minus)	- 2.00
MAX Height:	118.75



Maximum package chart for B747 side door.

WIDTH INCHES

(measured from bottom of pallet)

HEIGHT INCHES	10	20	30	40	50	60	70	80	90	100	110	120	130	134
120	470	412	367	331	302	280	259	239	219	198	179	161	----	-----
118	470	412	367	331	302	280	259	239	219	198	179	161	144	137
114	536	458	404	361	326	299	277	256	237	217	196	177	158	153
108	600	509	441	391	350	318	293	271	251	231	212	192	173	165
102	600	561	481	418	373	338	309	284	263	243	224	204	185	180
0-96	600	600	517	447	395	355	323	297	275	254	232	213	186	192

EXAMPLE: A package118" high and 70" wide can be up to 259" long and still fit into the main deck.

Maximum Package Chart for B747

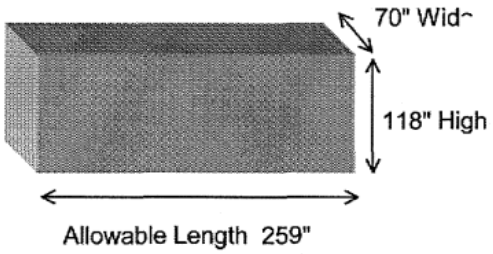


Table 4. 747 Main Deck Cargo Door Options.

AIRCRAFT SERIES	NOSE (VISOR) DOOR	SIDE CARGO DOOR
B747-100F/-MOD C	NO	STANDARD
B747-200-MOD C	NO	STANDARD
B747-200C	STANDARD	OPTIONAL
B747-200F	STANDARD	OPTIONAL*
B747-400F	STANDARD	STANDARD

NOTE: *The B747-200F normally will have the side cargo door option.

Table 5. -747 Shoring Kit.

SHORING KIT. Based on the standard 33-pallet configuration of the B747, the shoring requirements are listed below:				
SPOT	**TYPE WOOD**	**L x W x H**	**NO. OF LAYERS**	**LOCATION**
A	2x12	96” x 12” x 2”	1	Between PP 1 and 2, Laid side by side
B	3/4 PLY	96” x 48” x 3/4	2	Between 2 PP and 18, Stacked
C	2x12	192” x 12” x 2”	2	Center Aisle, Moved, as required, for driving over
D	3\4 PLY	48” x 48” x 3”	2	Between 32 PP and 33, Laid partially on top of pallets
E	3/4 PLY	130” x 30” x 3/4”	2	Side Door

NOTE: For CRAF-enhanced B747-100 MOD C and -200 MOD C, pallet positions 1,2, and 33 are not available; therefore, shoring for spots A, B, and D are not required

Table 6. -747 Lower Lobes.

AIRCRAFT	Forward Lower Lobe (FLL)				
	Door				
	W x H	AGL (MAX)	Length	Max Wt	Bulk Cube
B747SP	104”x66”	116”	315”		2178
B747 Lower Galley	104”x66”	128”	315”		2178
All Other B747	104”x66”	128”	504”	58,400	3485
Central Lower Lobe (CLL)					
	Door				
	W x H	AGL (MAX)	Length	Max Wt	Bulk Cube
B747SP	104”x66”	122”	315”		2178
B747 Lower Galley	104”x66”	124”	215”		1742
All Other B747	104”x66”	124”	436”	50,750	3015
B-747 Aft Lower Lobe					
		Aft Bulk Comp (ABC)			
AIRCRAFT		Door			
	W x H	AGL (MAX)	Length	Max Wt	Bulk Cube
B747SP	N/A	---	120	---	400
B747 Lower Galley	44”x47	132	240	---	800
All Other B747	44”x47”	132	240	14,800	800

15. Lower Lobe, Cargo Door. The following table (**7.**) can be used to determine the maximum package size that will fit through the 104 by 66-inch door found in the lower lob of the B747. Example: A package which is 90 inches wide and 60 inches high can be as long as 135 inches and still fit into the cargo compartment through the cargo door. Or, if the package is 80 inches wide and 195 inches long, it can be up to 40 inches high and still fit into the cargo area. However, these charts are for approximate measurements only.

Table 7. B747 LOWER LOBE, MAXIMUM LENGTH CHART (Exception: B747SP and other B747 models with lower galley)

Package Height (inches)	Package Width (inches)										
	10	20	30	40	50	60	70	80	90	100	104
66	280	245	220	195	170	155	125	125	125	125	125
60	330	285	240	220	196	175	160	145	135	125	125
55	385	325	280	245	215	215	175	155	145	135	135
50	440	360	305	265	230	210	185	165	150	145	140
45	440	430	360	300	260	225	200	170	155	150	155
40	440	440	410	345	290	255	220	195	175	160	155
35	440	440	440	380	330	270	235	205	180	160	160
30	440	440	440	420	345	285	245	210	190	165	160
25	440	440	440	440	360	300	255	220	190	165	160
20	440	440	440	440	385	315	265	225	195	170	160
15	440	440	440	440	415	330	280	235	200	175	160
10	440	440	440	440	440	360	295	245	210	180	165
5	440	440	440	440	440	440	320	265	225	185	170

16. Aft Bulk Cargo Door (104 X 66 inch). The following **Table 8.** is for the aft bulk cargo compartment, loading through the 104 by 66-inch door of the aft cargo compartment, but pushing the package in the aft direction into the bulk cargo compartment.

NOTE: A removable curtain separates the two cargo compartments.

Table 8. B747 LOWER LOBE, MAXIMUM LENGTH CHART (Aft Bulk Compt.).

Package Height (inches)	Package Width (inches)									
	10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
47	140	140	140	140	140	140	140	140	135	120
43	155	155	155	155	155	155	155	145	135	120
39	180	180	180	180	180	175	155	145	135	120
36	200	200	200	200	180	175	160	145	135	120
32	230	230	230	230	205	180	160	145	135	120
24-28	235	235	235	235	215	180	160	145	135	120
4-20	240	240	240	240	215	180	160	145	135	120

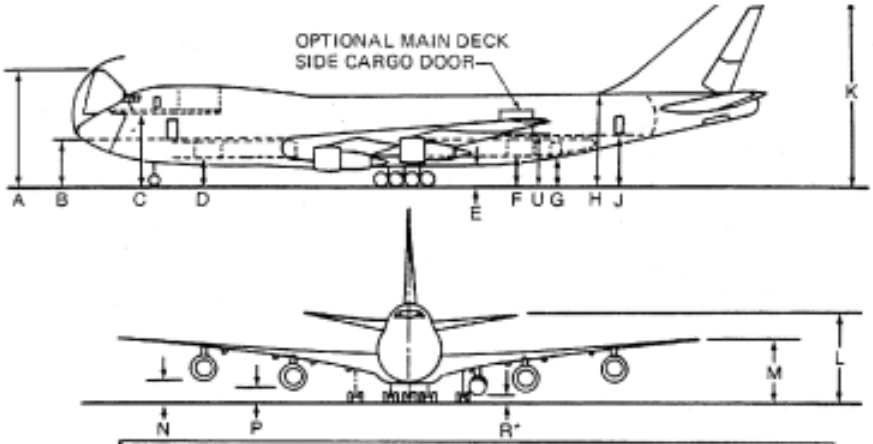
17. Aft Bulk Cargo Door (44 X 47 inch). The following **Table 9.** is for the aft bulk cargo compartment, loading through the 44 by 47-inch door, but pushing the package in the forward direction into the aft cargo compartment.

Table 9. B-747 LOWER LOBE, MAXIMUM LENGTH CHART.

Package Height (inches)	Package Width (inches)										
	4	**8**	**12**	**16**	**20**	**24**	**28**	**32**	**36**	**40**	**44**
47	140	140	140	132	126	121	117	114	110	108	108
43	160	160	155	145	140	135	130	125	120	115	110
39	180	165	155	150	140	135	130	125	120	120	120
36	185	170	160	150	145	135	130	125	120	120	120
32	190	175	165	155	150	140	135	130	125	120	120
28	200	185	170	160	155	145	135	130	125	120	120
24	220	190	175	165	155	145	135	130	125	120	120
20	220	195	180	170	155	145	135	130	125	120	120
16	230	205	190	175	160	150	140	135	125	120	120
12	235	220	200	180	165	155	145	135	130	125	120
8	235	235	215	195	175	160	150	140	130	125	120
4	235	235	225	210	185	170	155	145	135	125	120

NOTE: The block area indicates pushing the package toward the aft section of the aft bulk cargo compartment.

Figure 11. Ground Clearances 200F Cargo Configuration.



	VERTICAL CLEARANCES**							
	MINIMUM		MAXIMUM		NOSE GEAR TETHERING CONCEPT***			
					MINIMUM		MAXIMUM	
	FT-IN.	M	FT-IN.	M	FT-IN.	M	FT-IN.	M
A	37-8	11.48	40-5	12.32				
B	14-10	4.52	17-11	5.46	16-1	4.95	16-1	4.95
C	24-10	7.57	27-5	8.36				
D	8-6	2.59	10-8	3.25	9-5	2.87	9-7	2.92
E	6-3	1.88	6-9	2.08				
F	8-10	2.69	10-5	3.18	9-3	2.82	10-0	3.05
G	9-6	2.90	11-7	3.53	10-1	3.07	10-10	3.30
H	28-6	8.70	32-6	9.92				
J	15-0	4.57	17-10	5.44				
K	60-1	18.31	64-8	19.71				
L	26-11	8.20	31-2	9.50				
M	17-7	5.36	19-2	5.84				
N	6-0	1.82	7-0	2.13				
P	3-9	1.14	4-6	1.37				
R*	2-4	0.71	3-0	0.91				
U	15-4	4.67	17-6	5.33				

-200 Series

See Fig 5.3 for -400 Series Aircraft

*DENOTES GROUND CLEARANCE OF BUILT-UP POWER PACKAGE WHEN CARRIED AS SPARE.

**VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING/UNLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN. DURING ROUTINE SERVICING, THE AIRPLANE REMAINS RELATIVELY STABLE, PITCH AND ELEVATION CHANGES OCCURRING SLOWLY.

***AT MAJOR TERMINALS, A GSE TETHERING DEVICE MAY BE USED TO MAINTAIN STABILITY BETWEEN THE MAIN DECK DOOR SILL AND THE LOADING DOCK, OR CARGO BRIDGE ATTACHMENT FITTINGS LOCATED ON THE NOSE DOOR SILL AT THE FORWARD EDGE OF THE MAIN CARGO DECK MAY BE USED FOR CARGO SILL STABILIZATION.

GROUND CLEARANCES — CARGO CONFIGURATIONS
MODELS 747-200F

Figure 12. Interior Arrangement, Main Deck, Palletized Cargo.

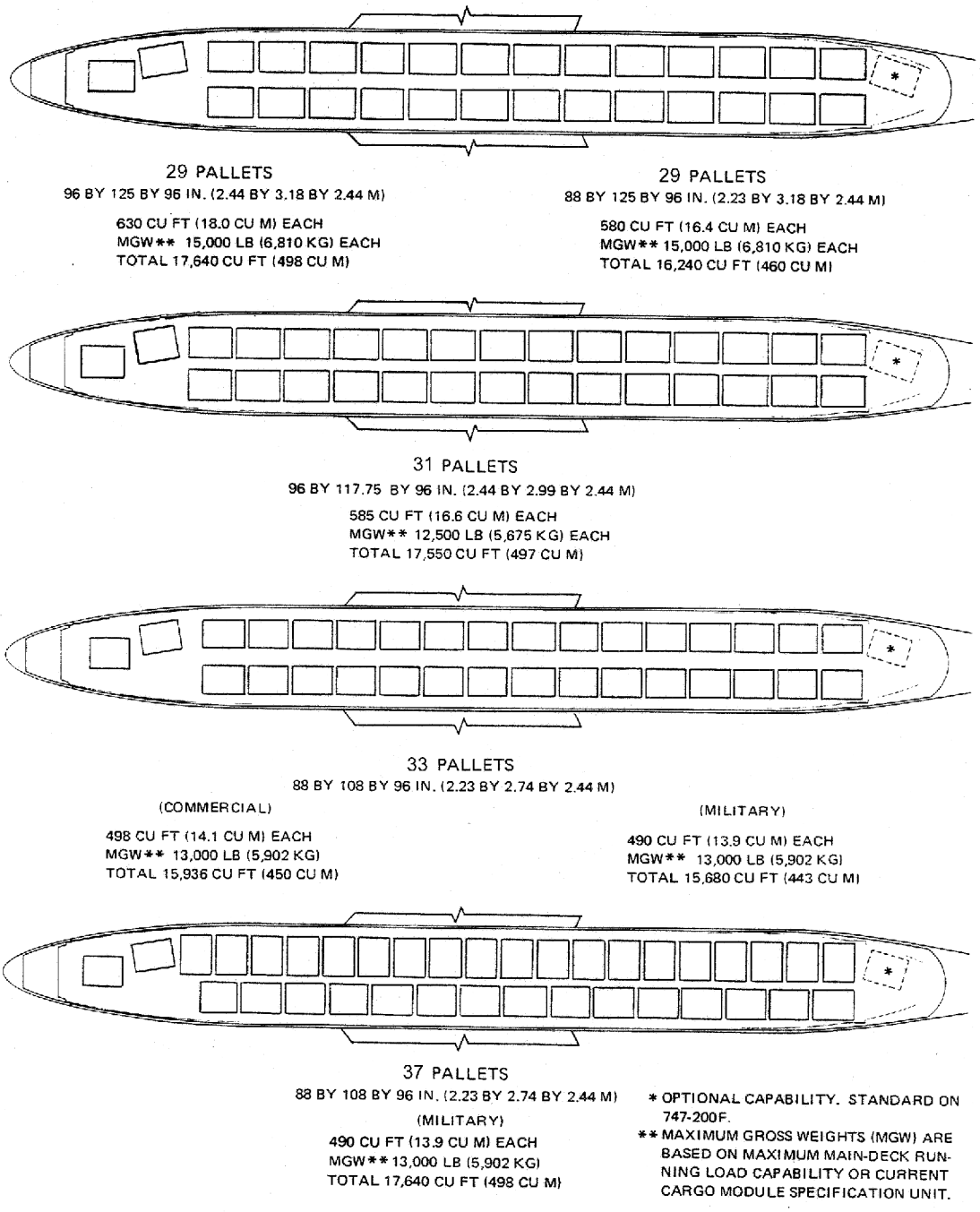
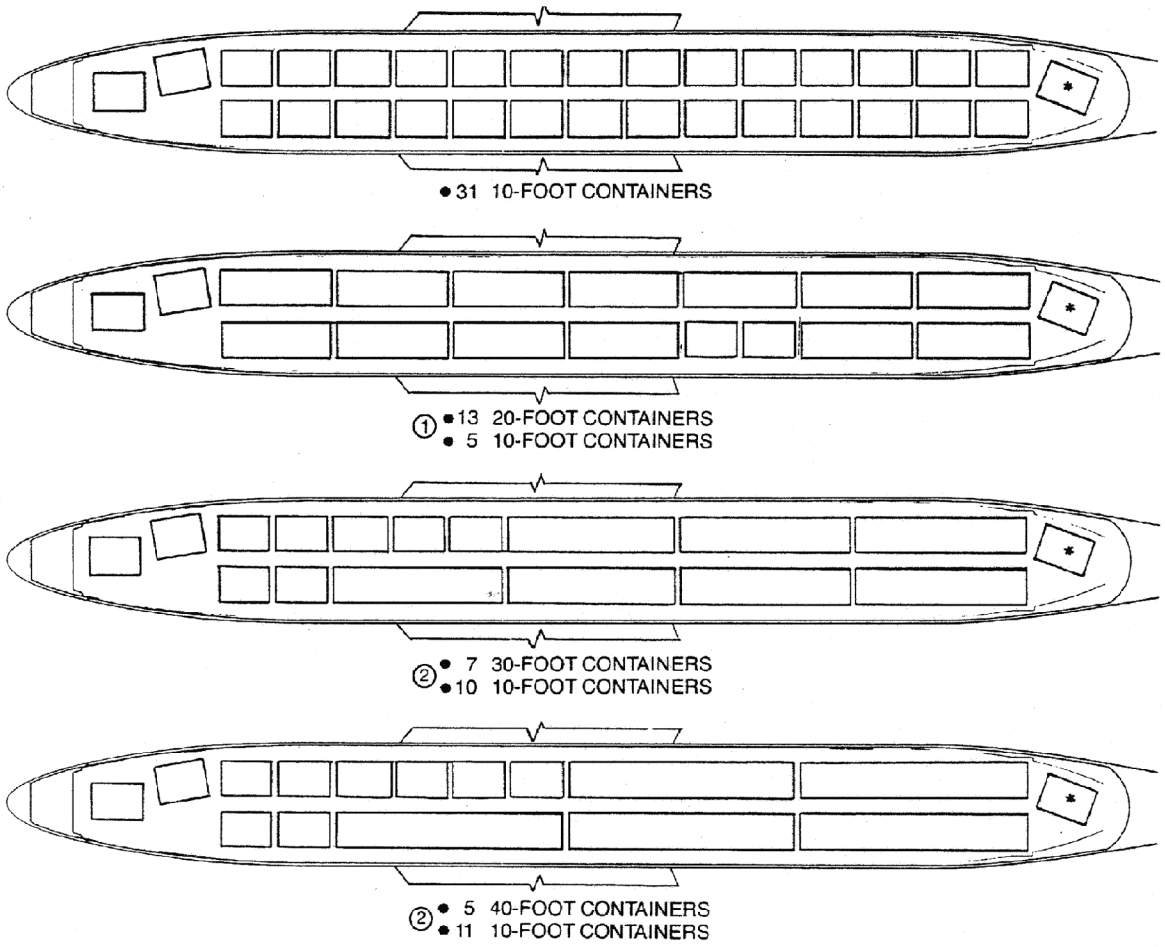


Figure 13. Interior Arrangement, Main Deck, Containerized Cargo.



① SPECIAL PROCEDURES ARE REQUIRED FOR SIDE-LOADING 20-FOOT CONTAINERS.

② 30-FOOT AND 40-FOOT CONTAINERS ARE LOADED THROUGH THE NOSE DOOR ONLY AND CANNOT BE LOADED INTO THE 747-100SF. THE SF DOES NOT HAVE NOSE-LOADING CAPABILITY.

CONTAINER DATA

DIMENSIONS							VOLUME		MAX. GROSS WEIGHT**	
LENGTH	INCHES			METERS						
FEET	W	L	H	W	L	H	CU FT	CU M	LB	KG
10	96	117.75	96	2.44	2.99	2.44	550	15.58	12,500	5,675
20	96	238.50	96	2.44	6.06	2.44	1,160	32.85	25,000	11,350
30	96	359.25	96	2.44	9.12	2.44	1,775	50.27	35,000	15,890
40	96	480.00	96	2.44	12.19	2.44	2,350	66.55	45,000	20,430

*OPTIONAL CAPABILITY

**MAXIMUM GROSS WEIGHTS ARE BASED ON MAXIMUM MAIN-DECK RUNNING LOAD CAPABILITY OR CURRENT CARGO MODULE SPECIFICATION LIMIT

INTERIOR ARRANGEMENTS—MAIN DECK, CONTAINERIZED CARGO
Models: 747-100, -200 and -400 Series

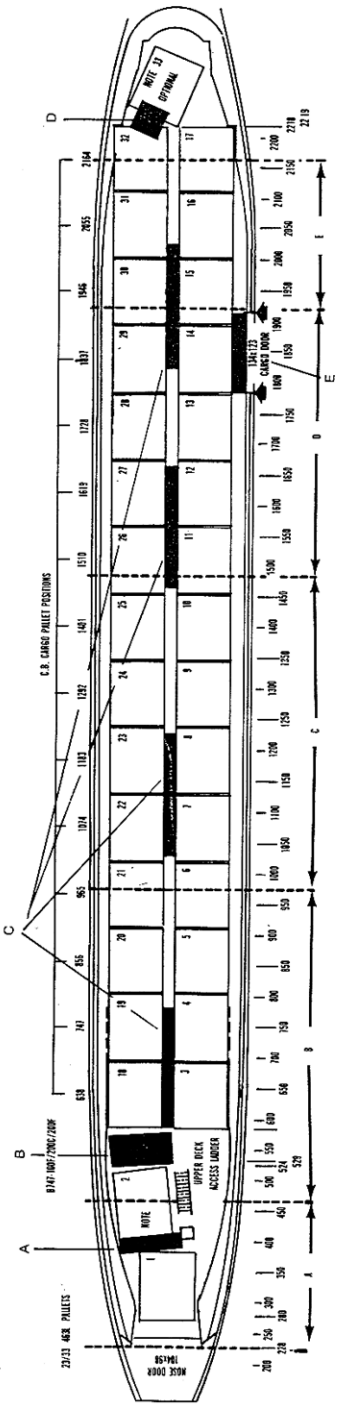
-100, -200 and -400 Series

Figure 14. B747 Shoring Kit.

SHORING KIT. Based on the standard 33 pallet configuration of the B747, the shoring requirements are as follows:

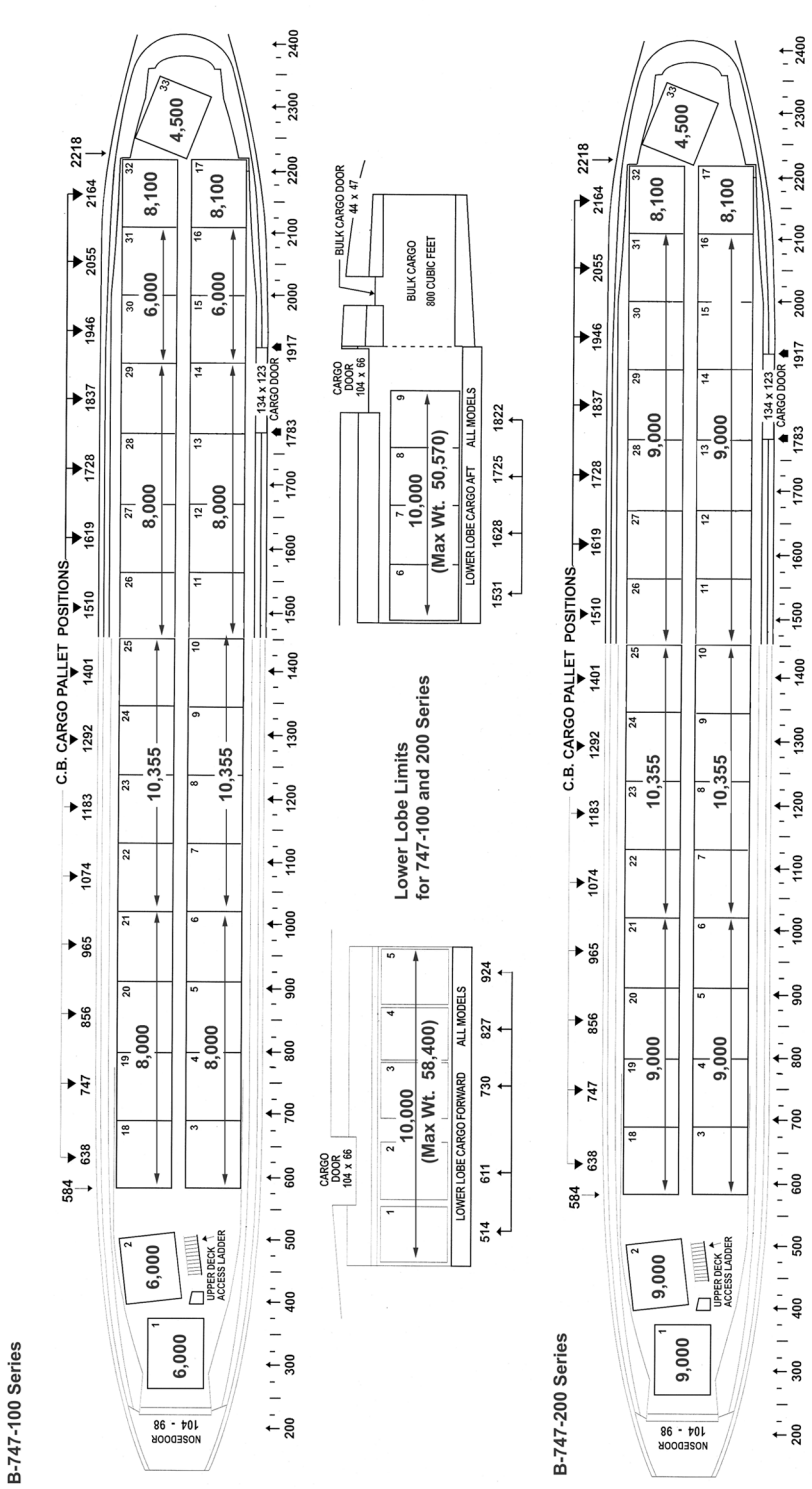
SPOT	TYPE WOOD	L X W X H	NO. OF LAYERS	LOCATION
A	2x12	96"x12"x2"	1	BETWEEN PP 1 AND 2—LAID SIDE BY SIDE
B	¾ PLY	96"x48"x¾"	2	BETWEEN 2 PP AND 18—STACKED
C	2x12	192"x12"x2"	2	CENTER AISLE, MOVED AS REQUIRED FOR DRIVING OVER
D	¾ PLY	48"x48"x3"	2	BETWEEN 32 PP AND 33, LAID PARTIALLY ON TOP OF PALLETS
E	¾ PLY	130"x30"x¾"	2	SIDE DOOR

NOTE: For CRAF-enhanced B747 (-100 MOD C and -200 MOD C), pallet positions 1, 2, and 33 are not available; therefore, shoring for spots A, B, and D are not required.



NOTES:
1. Based on this shoring kit, loading items no heavier than a ¾-ton trailer on pallet positions 1, 2, and 33 is recommended.
2. The shoring depicted above is for side door loading. For nose door loading, spot E is not required; shoring for spots A and B will not be needed using the slave pallet method between the loader and FS 580.

Figure 15. B747-100 and –200 Maximum Pallet Weight Limits 33 pallet Configuration.



B-747 -100 and -200 Series MAX WEIGHT TABLE. (33 PALLETS)

NOTE: All weights are for general planning purposes; Carrier has final authority.

1. All weights are Maximums and include weight of pallets and nets.
2. Weights are for -100, and -200 series aircraft respectively.
3. All weights are for individual pallets.

Directions:

1. Weights on Main Deck assume empty lower lobe.
2. Weights in lower lobe assume empty main deck.
3. The Combined main deck and lower lobe weights cannot exceed main deck limits on a vertical plan (i.e., on a -200 series jet, 14,000 lbs. in pp 18 and 3 limits the lower lobe pallet #2 to 4,000 lbs.)

B747-400 Maximum Pallet Weight Limits 33 pallet Configuration.

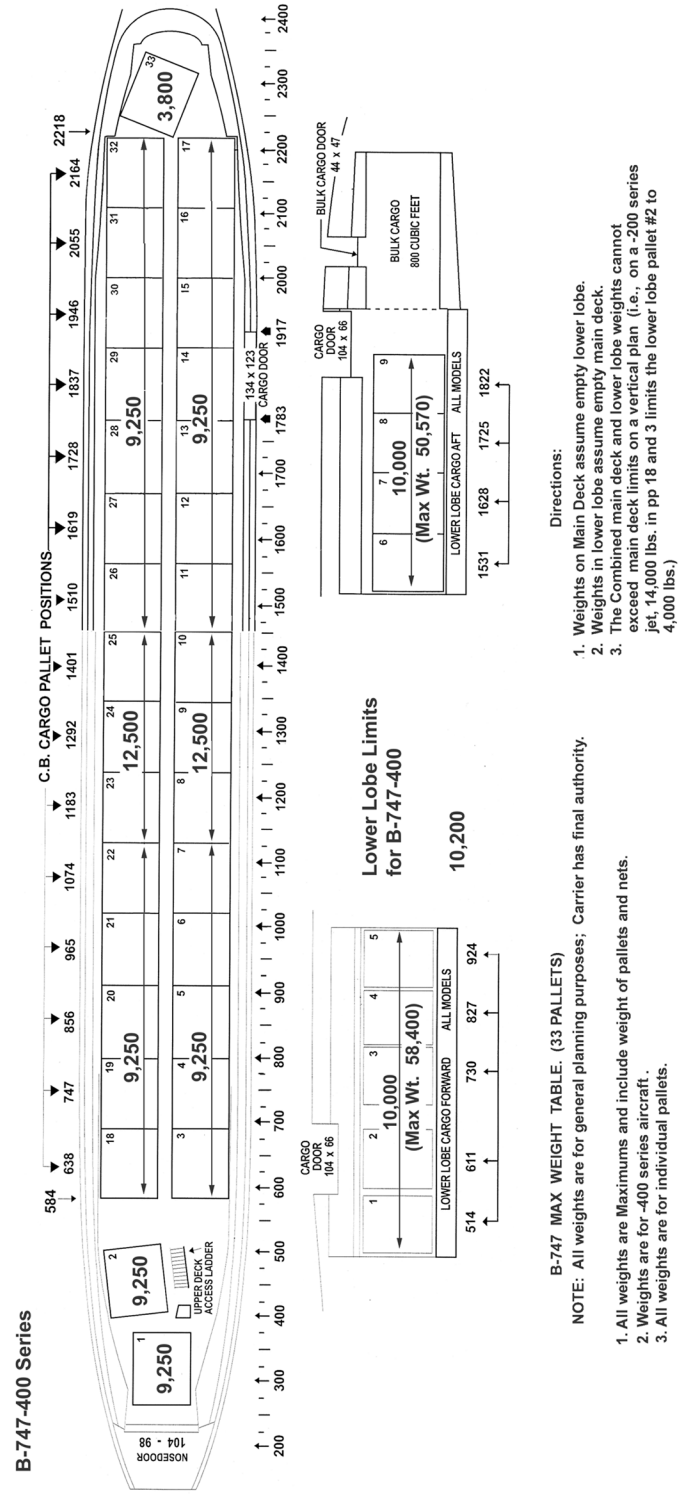


Figure 16. B747 Maximum Pallet Weight Limits 37 pallet Configuration.

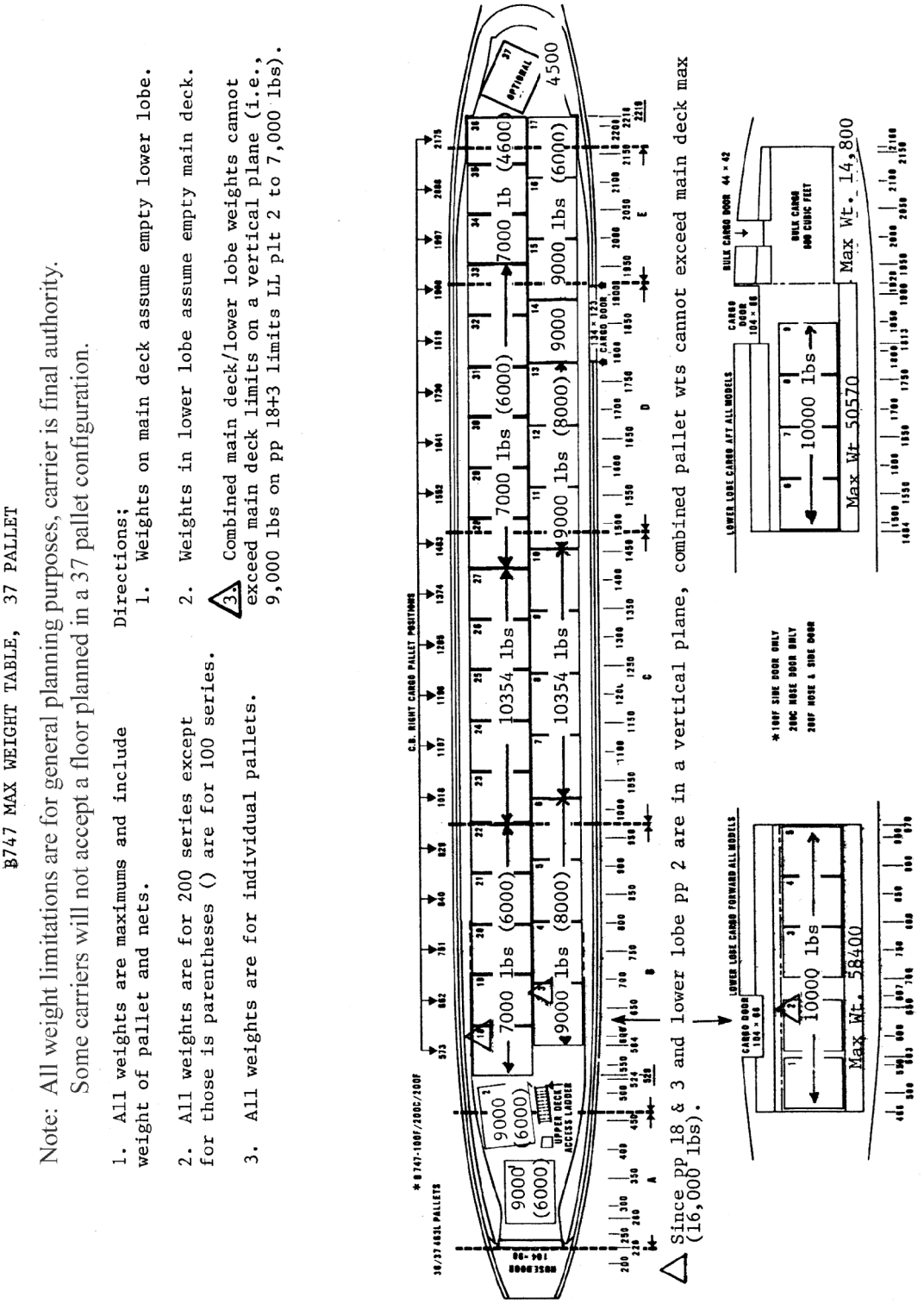


Figure 17. B747 Main Cargo Floor layout, 33 and 37 pallet Configuration.

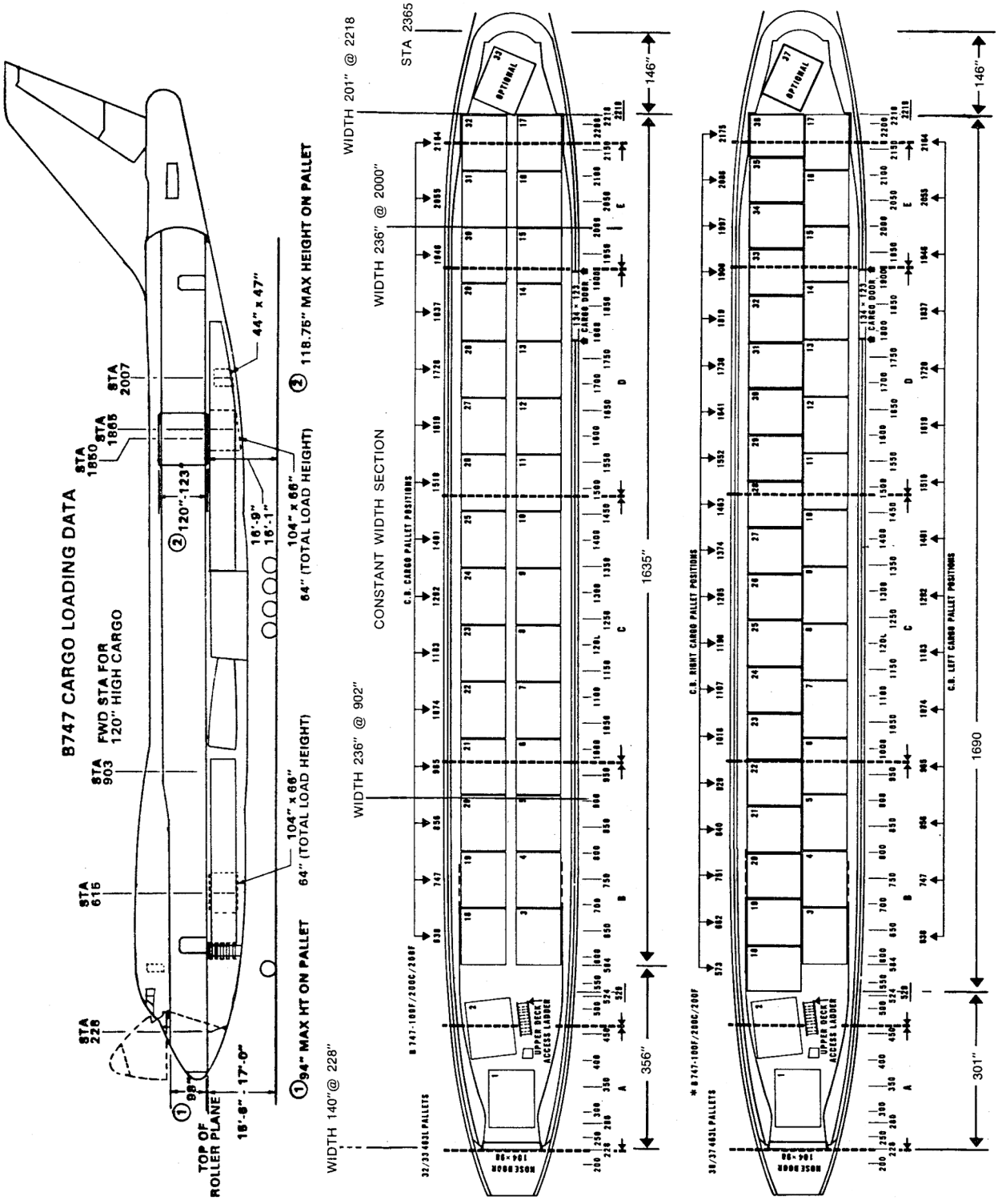
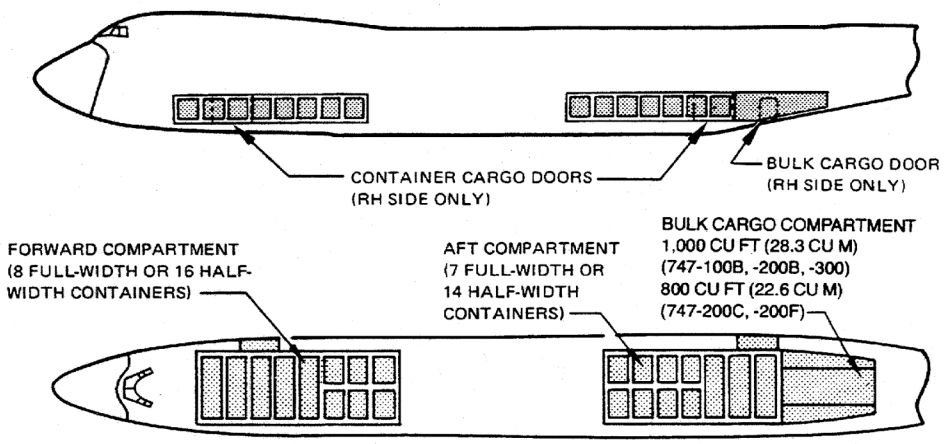
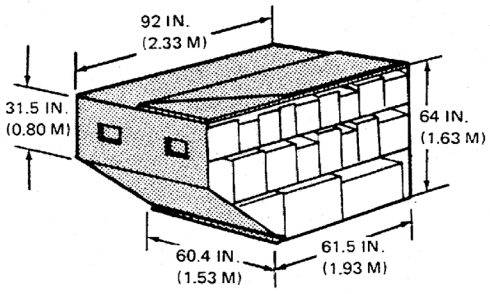


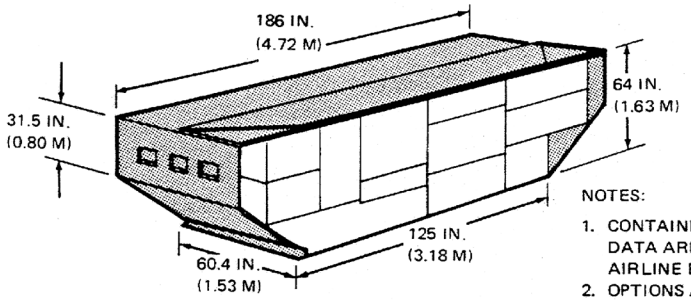
Figure 18. Lower Cargo Compartments, Containers and Bulk Cargo.





HALF-WIDTH CONTAINER

CONTAINER DATA		
	HALF-WIDTH	FULL-WIDTH
INTERNAL VOLUME PER CONTAINER	173 CU FT 4.9 CU M	350 CU FT 9.9 CU M
TARE WEIGHT PER CONTAINER	270 LB 123 KG	470 LB 213 KG
MAXIMUM CARGO WEIGHT PER CONTAINER	3,230 LB 1,467 KG	6,530 LB 2,965 KG
MAXIMUM GROSS WEIGHT PER CONTAINER	3,500 LB 1,590 KG	7,000 LB 3,180 KG
TOTAL VOLUME OF 15 FULL-WIDTH CONTAINERS –5,250 CU FT (148.5 CU M)		
TOTAL VOLUME OF 30 HALF-WIDTH CONTAINERS –5,190 CU FT (147.0 CU M)		
GROSS WEIGHT FOR 15 FULL-WIDTH OR 30 HALF-WIDTH CONTAINERS–105,000 LB (47,670 KG)		



FULL-WIDTH CONTAINER

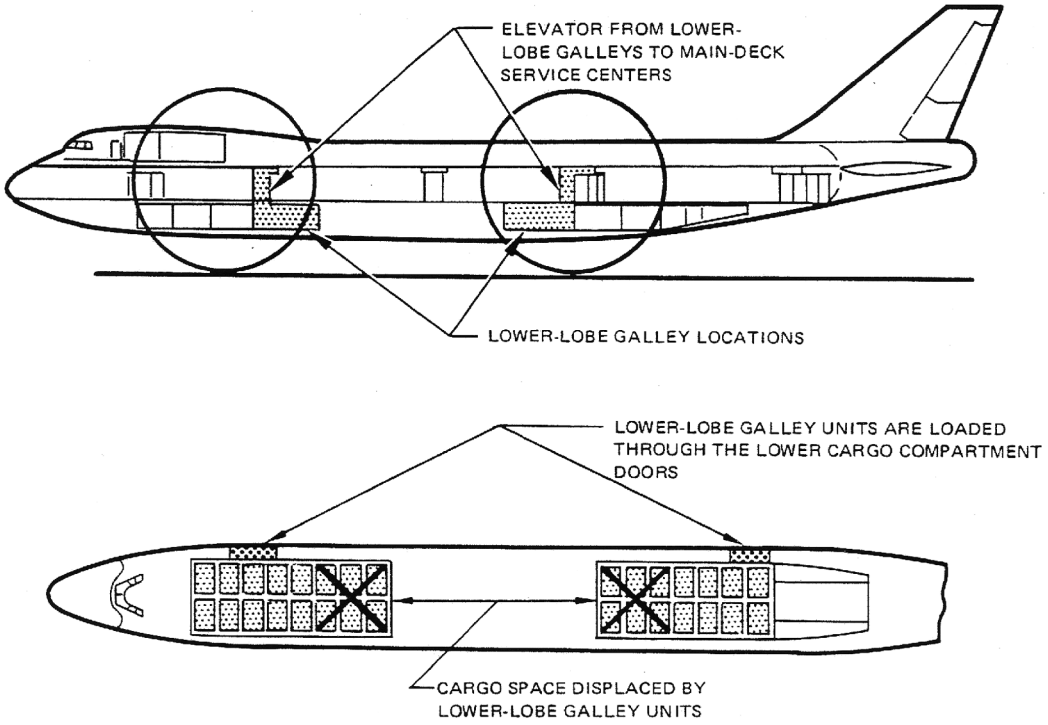
-100, -200 Series

NOTES:

1. CONTAINER WEIGHT AND VOLUME DATA ARE TYPICAL. CONSULT USING AIRLINE FOR SPECIFIC DATA.
2. OPTIONS ARE OFFERED FOR CARRIAGE OF CERTAIN STANDARD MILITARY AND COMMERCIAL PALLETS IN CONTAINER COMPARTMENTS.

LOWER CARGO COMPARTMENTS — CONTAINERS AND BULK CARGO
MODELS 747-100B, -200, -300

Figure 19. Lower Cargo Compartments, Lower Lobe Galley Options.



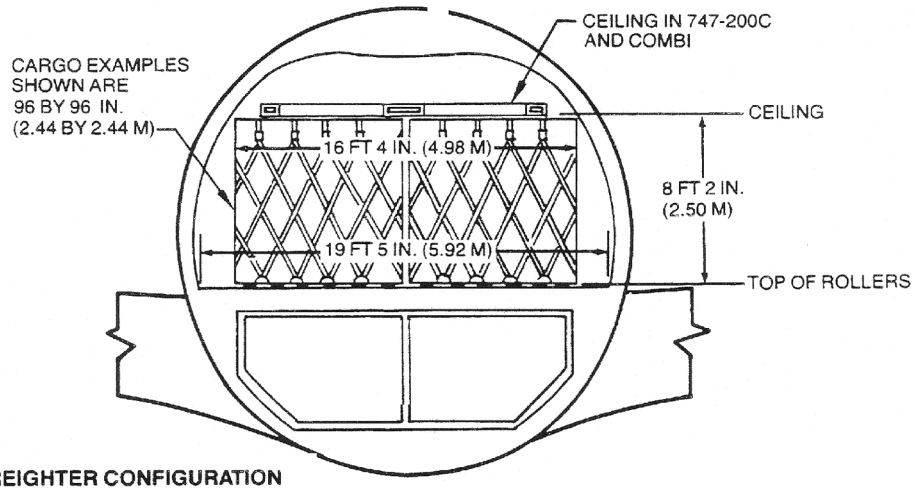
COMPARISON OF CARGO VOLUME WITH/WITHOUT LOWER-LOBE GALLEYS		
	WITH MAIN-DECK GALLEYS	WITH LOWER-LOBE GALLEYS
NUMBER OF CONTAINERS	30	18
CONTAINER VOL–CU FT (CU M)	5,190 (147)	3,114 (88.2)
BULK CARGO VOL–CU FT (CU M)	1,000 (28.3)**	1,000 (28.3)**
TOTAL VOL: CU FT (CU M)	6,190 (175.3)	4,114 (116)

** 800 CU FT (22.6 CU M) ON 747-200C AND COMBI

-100, -200 Series

LOWER CARGO COMPARTMENTS — LOWER-LOBE GALLEY OPTION
MODELS 747-100B, -200B, -200C

Figure 20. Cabin Cross Section.



FREIGHTER CONFIGURATION

NOTE: The above configuration is applicable only on the Convertible and Combi versions only.

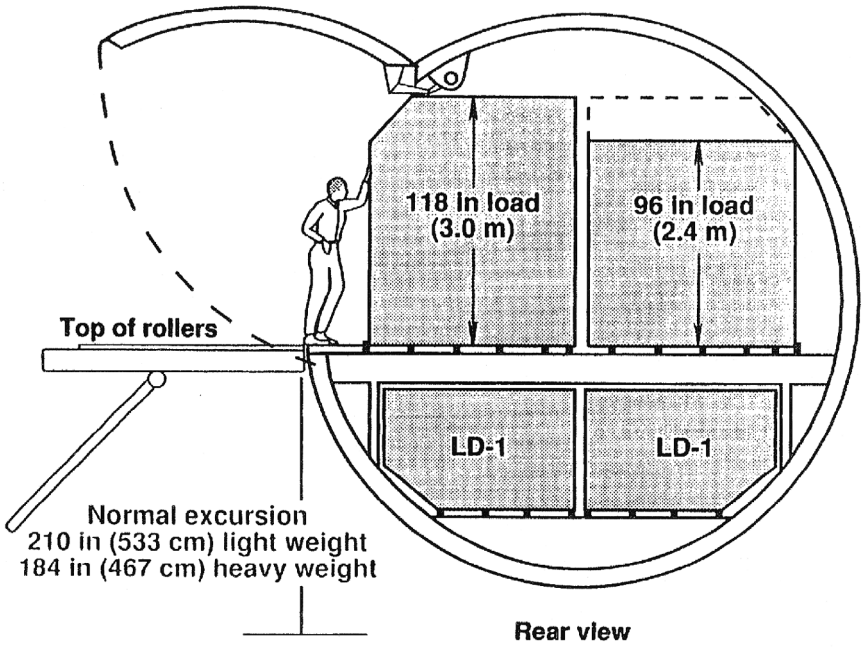


Figure 21. B747–100F Cross Section.

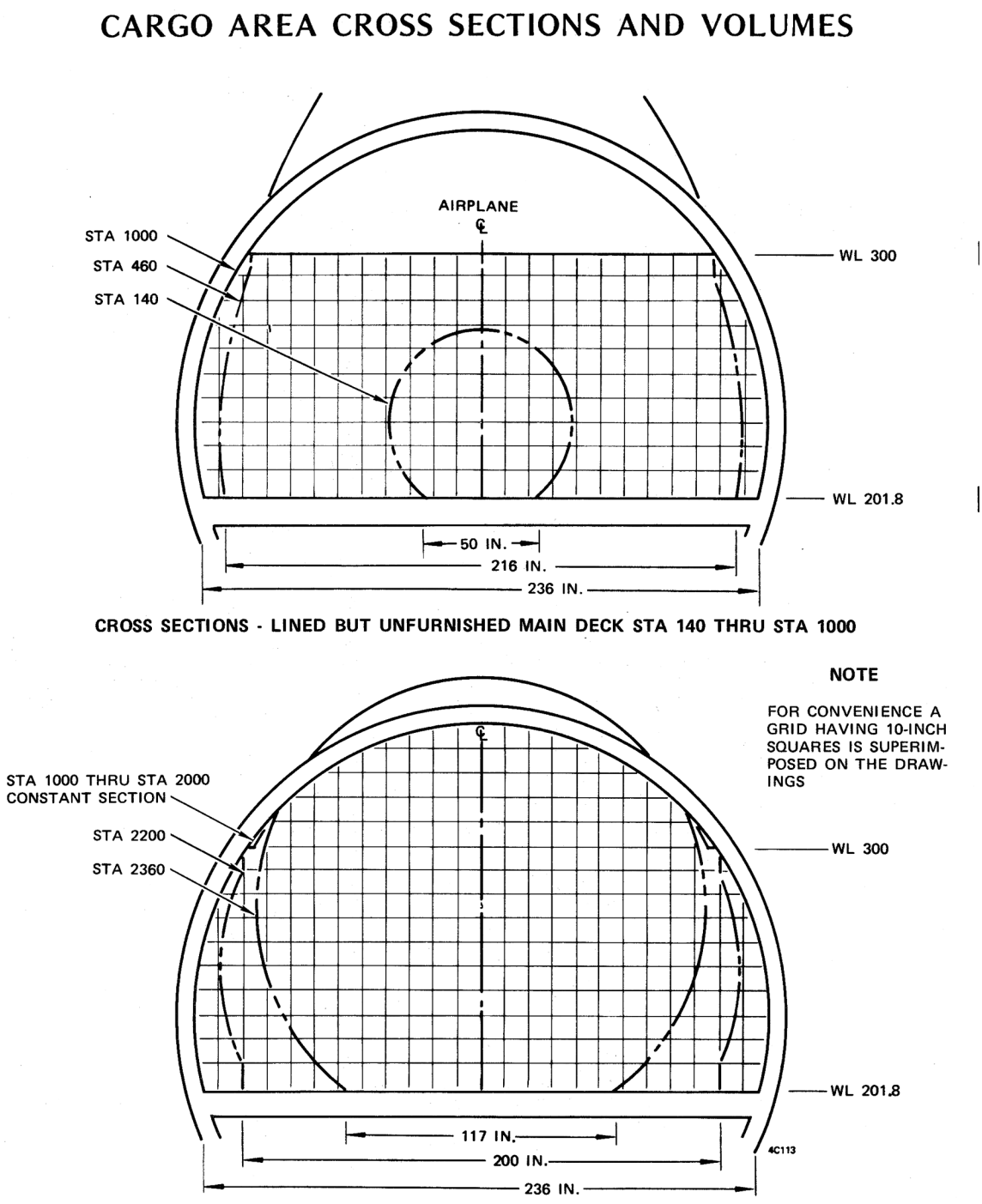


Figure 22. B747 Cross Section 200F Series.

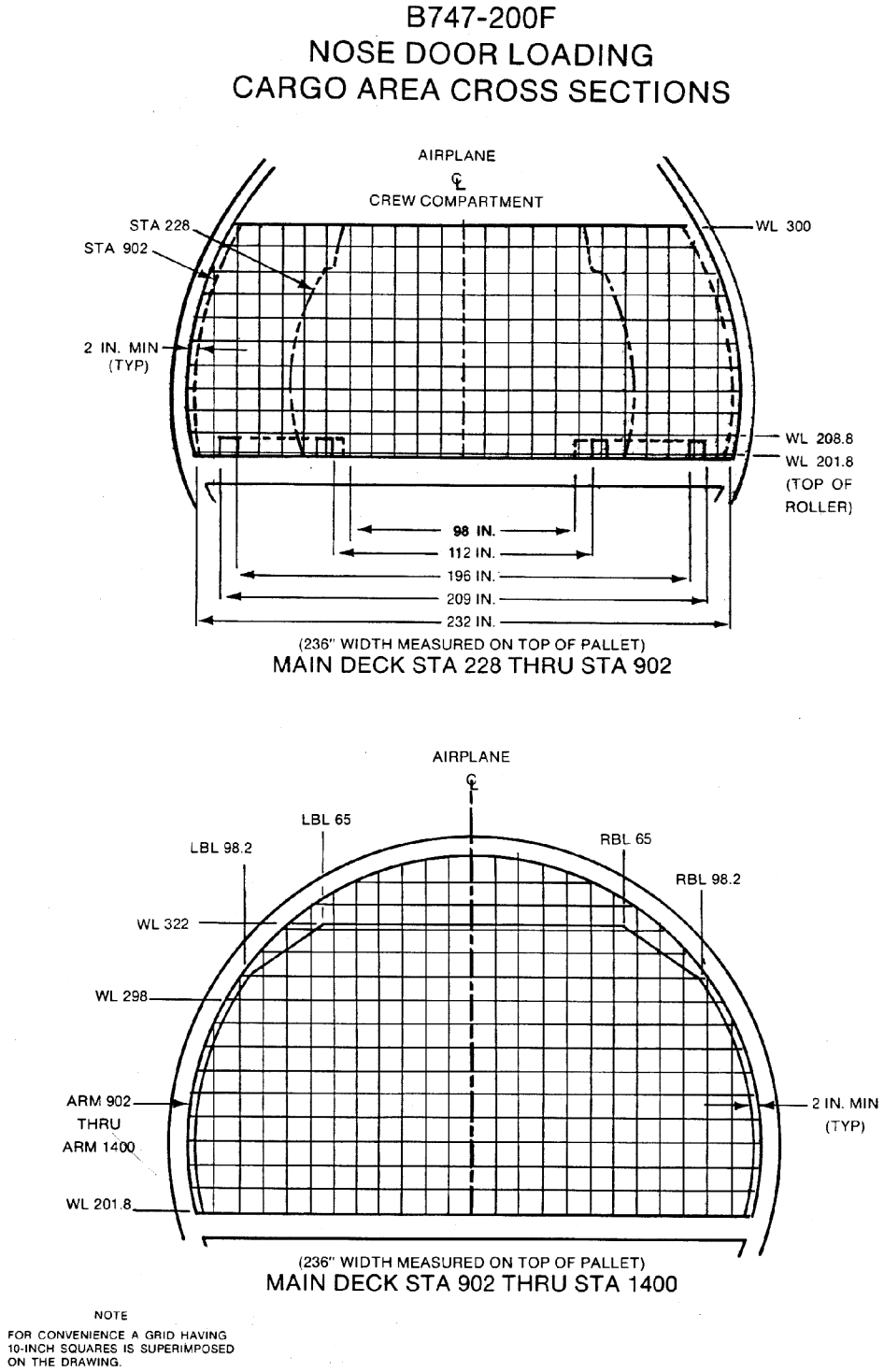


Figure 23. B747 Cross Section 200F Series.

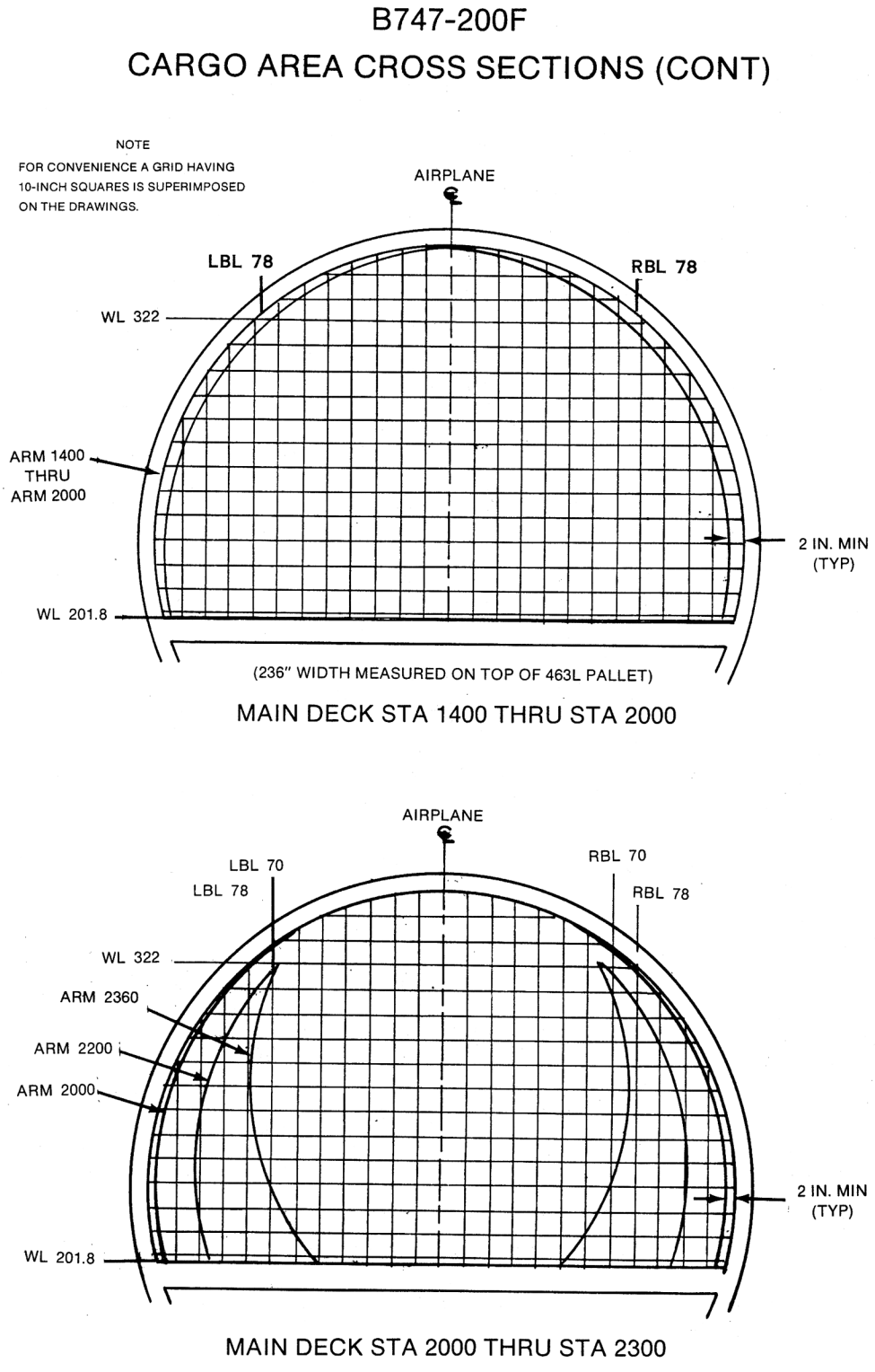


Figure 24. Door Clearances, Nose Cargo Door.

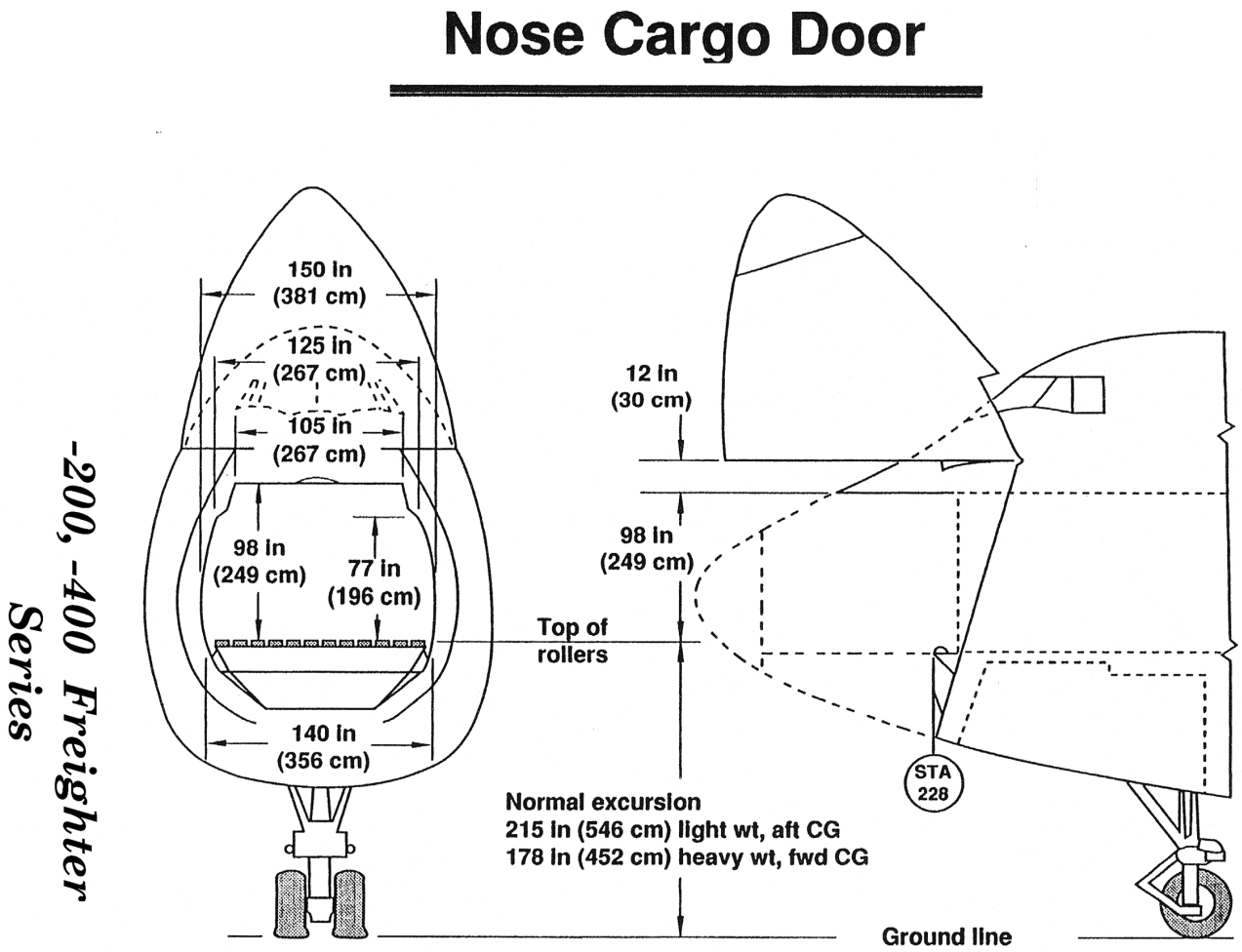


Figure 25. Freighter Cargo Door Arrangement.

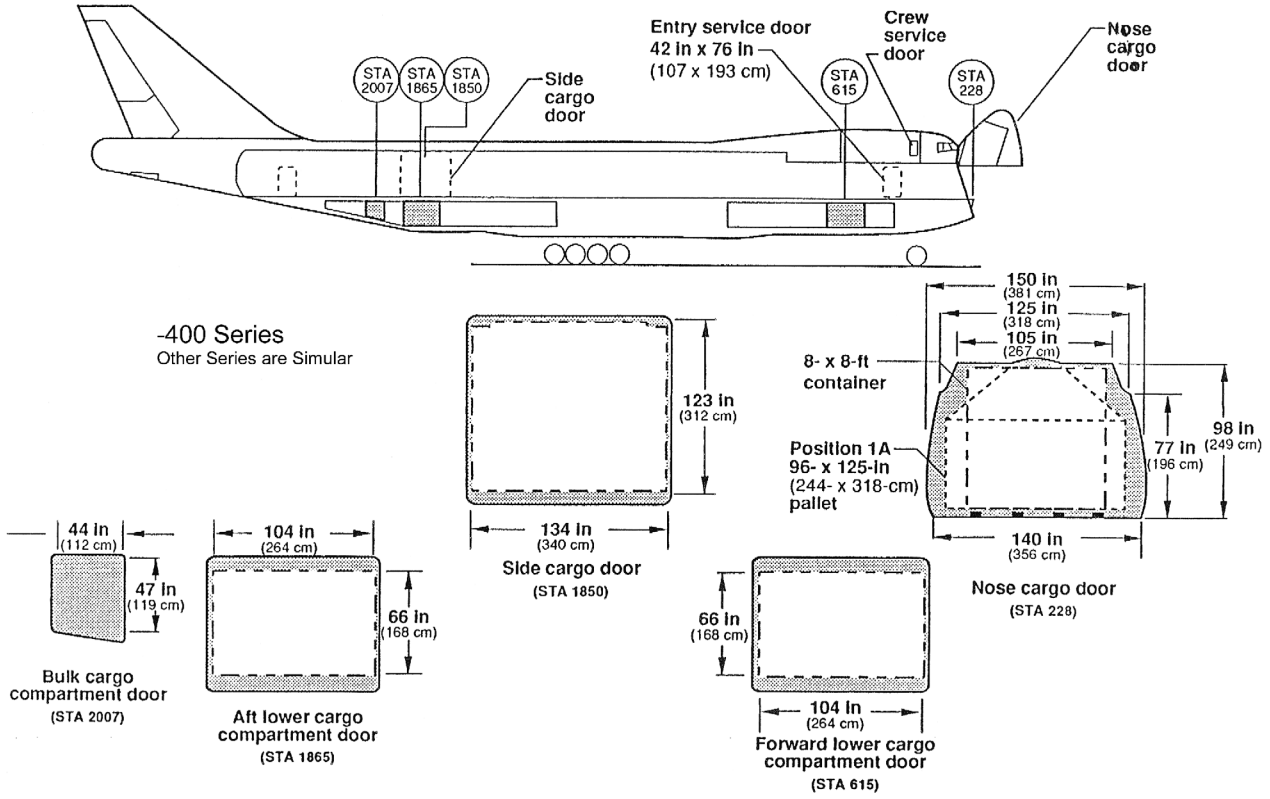


Figure 26. Lower Cargo Compartment Door.

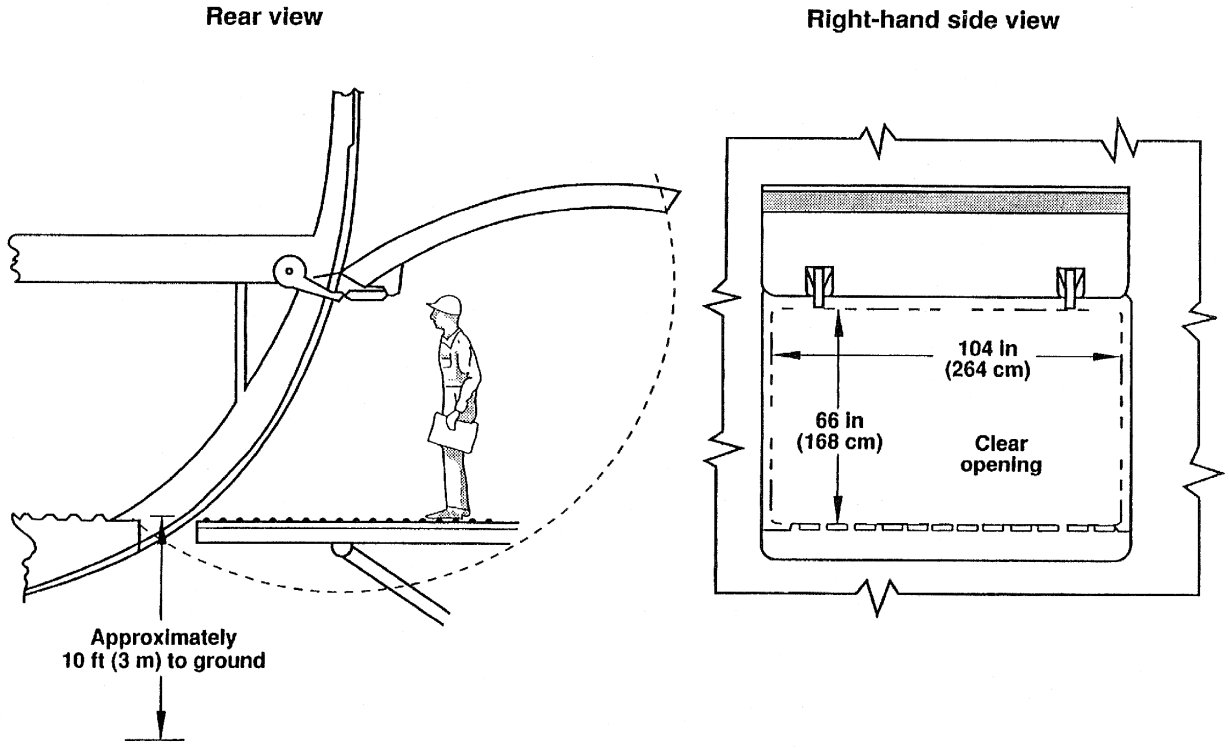
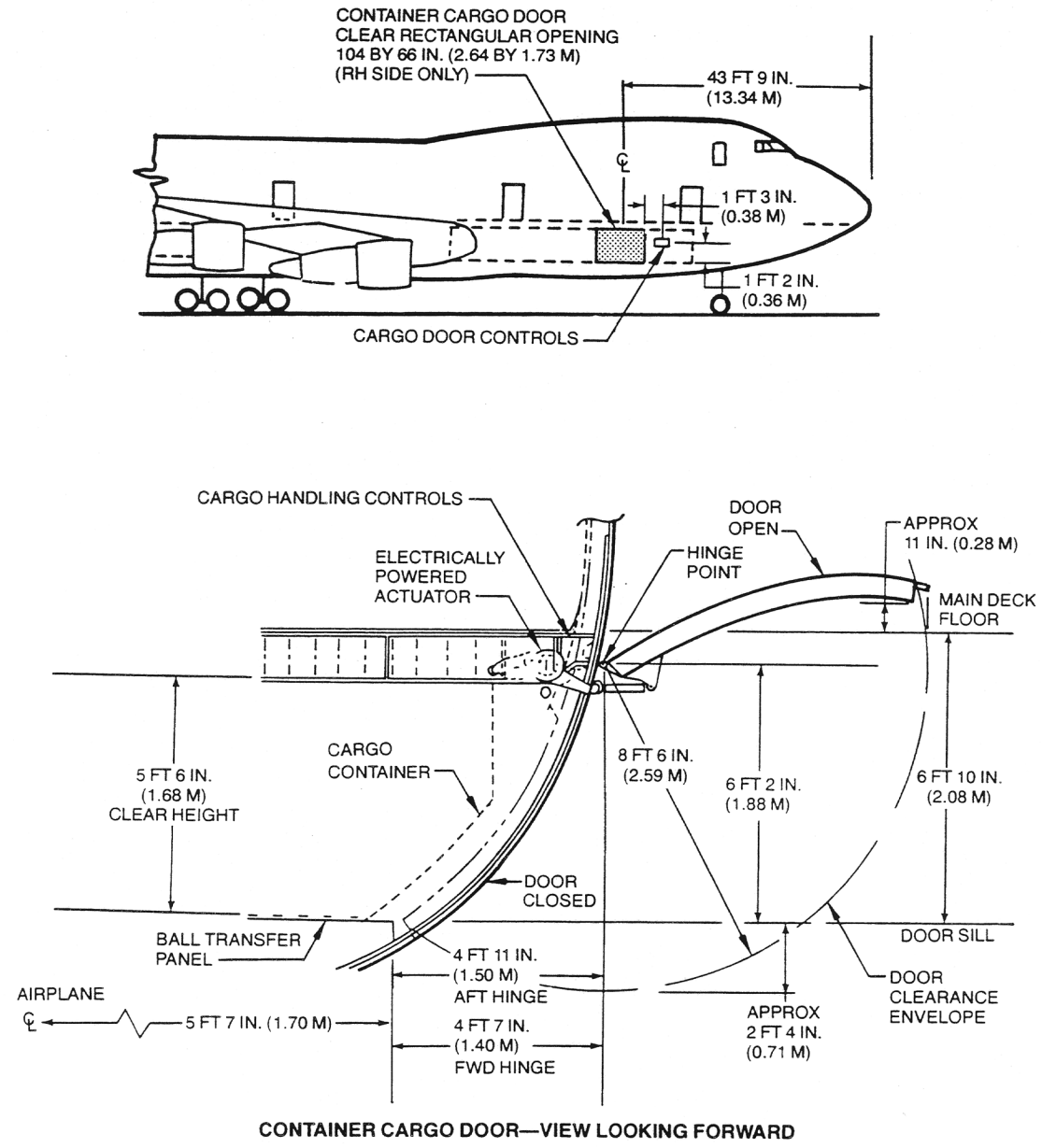


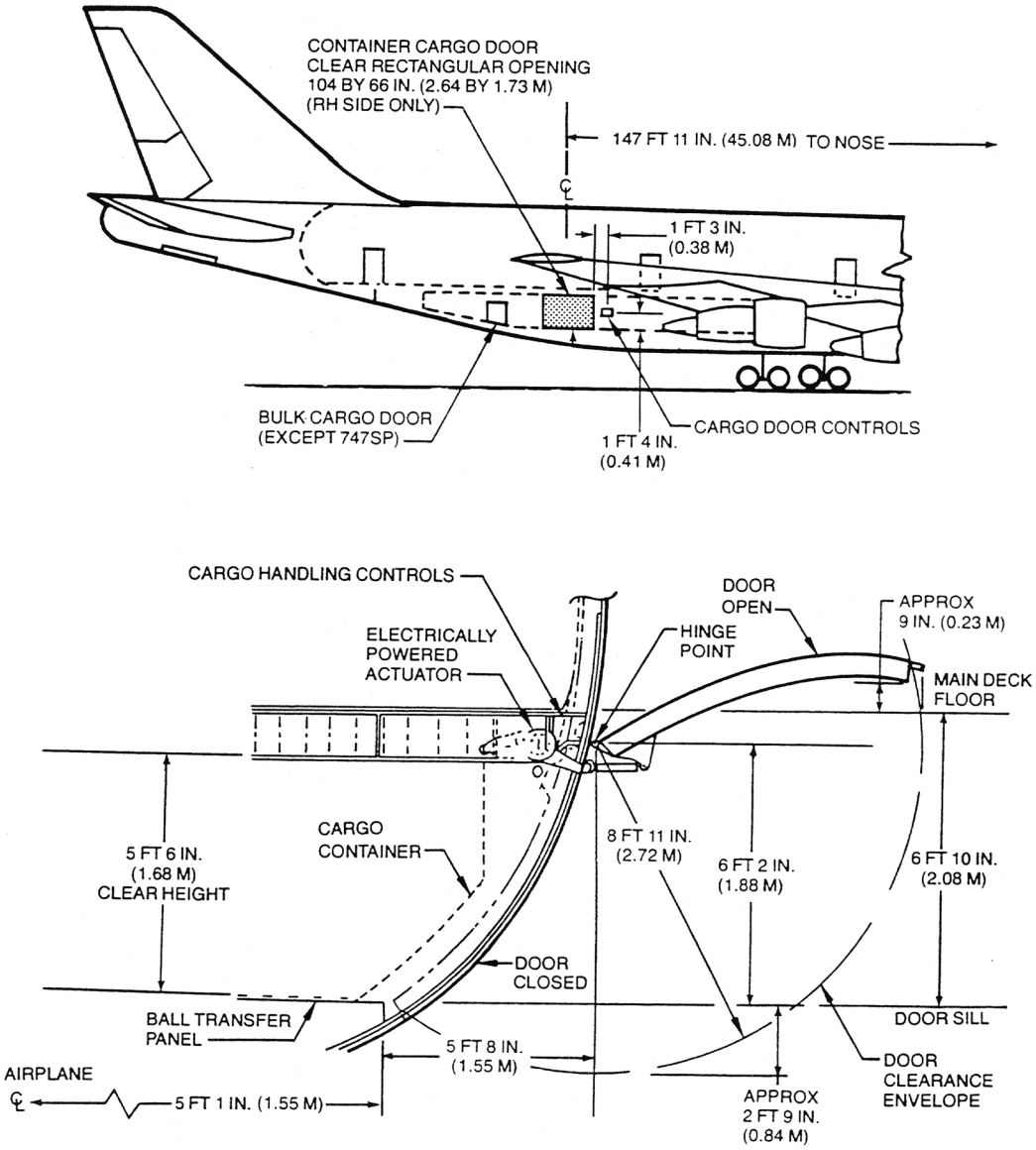
Figure 27. Door Clearances, Lower Forward Cargo Compartment.



DOOR CLEARANCES — LOWER FORWARD CARGO COMPARTMENT
MODEL 747

All Series

Figure 28. Door Clearances, Lower Aft Cargo Compartment.

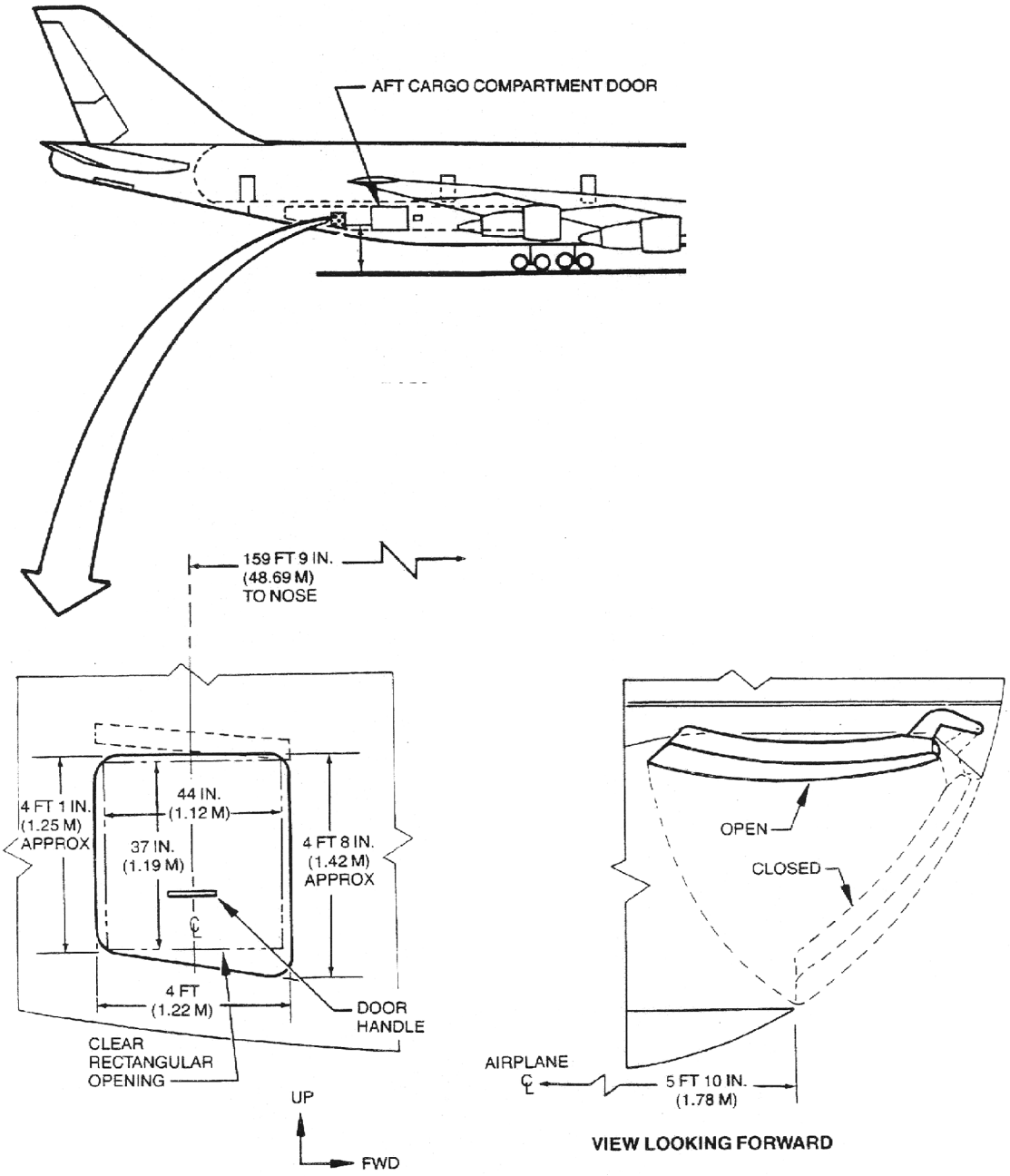


CONTAINER CARGO DOOR—VIEW LOOKING FORWARD

DOOR CLEARANCES — LOWER AFT CARGO COMPARTMENT
MODEL 747

All Series

Figure 29. Door Clearances, Bulk Cargo Compartment.

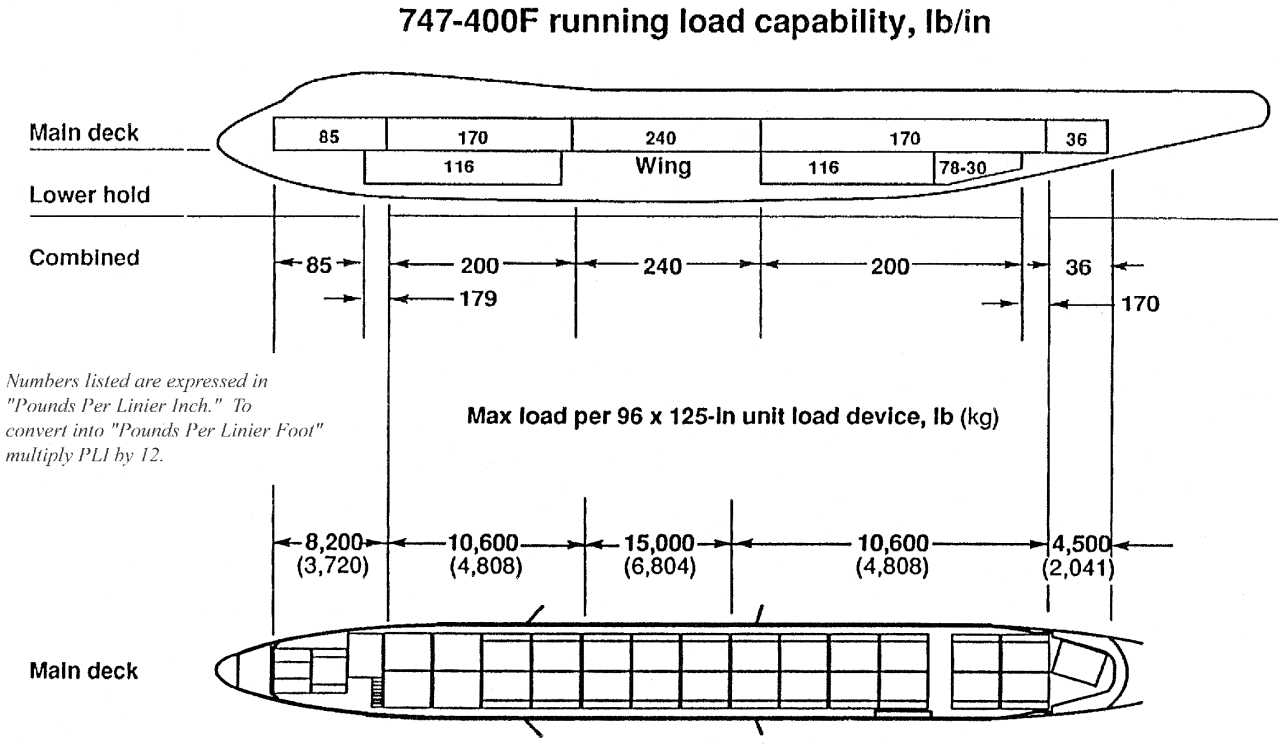


DOOR CLEARANCES — BULK CARGO COMPARTMENT

Models 747-100, -200 and -400

-100, -200 and -400 Series

Figure 30. B747-400 Running Load (Pound Per Linear Foot) Limits.



ROGER A. BRADY, Maj Gen
Director of Operations

ATTACHMENT 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

Abbreviations and Acronyms

ABC—aft. bulk compartment

ACL—Allowable Cargo/Cabin Load

AESS—Aeromedical Evacuation Ship Set

AFB—Air Force Base

AFR—Air Force Regulation

AGL—Above Ground Level

TALCE—Tanker Airlift Control Element

ALCS—Airlift Control Squadron

ALS—Airlift Squadron

AMC—Air Mobility Command

AMCOS—Air Mobility Combat Operations Staff

AMCP—Air Mobility Command pamphlet

AMCR—Air Mobility Command regulation

APC—Armored Personnel Carrier

APS—Aerial Port Squadron

ASD—Aeronautical Systems Division

ATA—Air Transport Association

AW—Airlift Wing

BL—Butt Line

CB—Center of balance (or center of gravity)

CCE—Commercial Construction Equipment

CF/F—Convertible Freighter Or Freighter

CFR—Code of Federal Regulations

CG—Center Of Gravity (Or Center Of Balance)

CIV—Civilian/Civil

CL—Center Line

CLL—Center Lower Lobe

COMBI—Combination

COMM—Commercial

CONF—Configuration

CRAF—Civil Reserve Air Fleet

CU FT—Cubic Feet

DDT—Double Dual Tandem Type Landing Gear (B-747 etc.)

DIST—Distance

DOD—Department of Defense

EST.—Estimate

ELEV—Elevator

FAA—Federal Aviation Administration

FAR—Federal Aviation regulation

FLL—Forward Lower Lobe

FS—Flight Station Or Fuselage Station

GACL—Guaranteed Allowable Cabin (Or Cargo) Load

HGT—Height

HQ—Headquarters

IATA—International Air Transport Association

IN.—Inches

JSCP—Joint Strategic Capabilities Plan

LAT.—Laterally

LBL—Left Butt Line

LCN—Load Classification Number

LONG—Longitude

LOX—Liquid Oxygen

LOSS—Liquid Oxygen Subsystem

MAC—Mean Aerodynamic Chord

MAX—Maximum

MHE—Material Handling Equipment

MIL—Military

MOS—Medical Oxygen Subsystem

MSU—Multi-Servicing Unit

MTMC—Military Traffic Management Command

MTOW—Maximum Take Off Weight

MLW—Maximum Landing Weight

MZFW—Maximum Zero Fuel Weight

N/A—Not Applicable

NM—Nautical Mile (Statute Mile X 1.15)

OEW—Operating Empty Weight

OL—Operation Location

PAX—Passenger

PDO—Publications Distribution Office

PLF—Pounds Per Linear Foot

PLI—Pounds Per Linear Inch

PLS—Patient Loading System

PP—Pallet Position

PSF—Pounds Per Square Foot

PSI—Pounds Per Square Inch

RBL—Right Butt Line

RWY—Runway

SBTT—Single-Belly Twin Tandem Landing Gear (DC-10, KC-10 etc.)

S/T—Short Ton (2,000 lbs.)

SPR—Single Point Refueling

STN—Station

TACC—Tanker Airlift Control Center

TAW—Tactical Airlift Wing

TO—Technical Order

T/O—Takeoff

TT—Twin Tandem (DC-8, B757, B767)

UKN—Unknown

WDT—Width

WBEL—Wide Body Elevator Loader

WL—Water Line

WRSK—War Readiness Spares Kit

WT—Weight

ZFW—Zero Fuel Weight

ATTACHMENT 2

INTERNATIONAL CARGO AND PASSENGER PLANNING FACTORS

Table A2.1. CRAF LONG-RANGE INTERNATIONAL CARGO PLANNING FACTORS

Aircraft Type	Maximum ACL (s/t)	Pallets	Range with Maximum ACL (nautical mi)	Maximum ACL (s/t) per Leg Length (nautical mile)				Ferry Range No Cargo (nautical mi)
				2,000	2,500	3,000	3,500	
A300-600F	56.6	15	1,800	54	52.5	46	40	4,450
B-757-200F	43	13	3,600	43	43	43	43	4,850
B-767-300F	65.9	26	3,500	65.9	65	65.9	65.9	7,150
DC-8-55F	43.8	13	2,400	43.8	42.5	37	31.5	4,700
DC-8-62F	44	14	3,500	44	44	44	44	5,600
DC-8-62 Combi	36	10	3,450	36	36	36	35.5	5,700
DC-8-63F	55	18	2,250	55	52.3	47.5	42.8	4,600
DC-8-71F	48.5	18	2,300	48.5	45	38.5	32.3	4,700
DC-8-73F	54.3	18	2,500	54.3	54.3	50.3	43.5	4,800
B-747-100F	106.5	33	3,200	106.5	106.3	106.5	99.8	6,800
B-747-200F	120	33	3,200	120	120	120	112	7,900
B-747-300F	116	33	3,100	116	116	116	113.5	7,900
B-747-400F	129.7	33	3,800	129.7	129.7	129.7	129.7	8,650
DC/MD-10-10F	69.3	30	2,000	69.3	61.25	54.6	46.7	4,200
DC-10-30CF	71.8	30	3,000	71.8	71.8	71.8	69.5	6,700
DC/MD-10-30F	83.1	30	3,600	83.1	83.1	83.1	83.1	6,700
MD-11CF	89	35	4,500	89	89	89	89	7,800
MD-11F	96	35	3,750	96	96	96	96	7,800
L-1011-200F	63	26	2,600	63	63	55.5	48.5	3,750

NOTE: **Ferry Range is distance the aircraft can fly with no cargo**

Table A2.2. CRAF LONG-RANGE INTERNATIONAL PASSENGER PLANNING FACTORS

Aircraft Type	Maximum Seats (Troops)	Range with Maximum Troops (NM)	Maximum Troops per Leg Length (NM)				Ferry Range No Troops (NM)
			2,000	2,500	3,000	3,500	
A-300-600ER	138	3,200	138	138	138	120	4,260
B-757-200	127	2,300	127	120	103	85	4,400
B-757-200ER	131	3,175	131	131	131	116	4,700
B-757-300ER	166	2,700	166	166	150	126	4,400
DC-10-10	222	2,300	222	201	150	100	4,000
DC-10-30	235	3,900	235	235	235	235	5,800
DC-10-40	222	2,750	222	222	203	160	4,875
DC-10-40J	219	3,200	219	219	219	195	4,856
MD-11	233	5,000	233	233	233	233	6,800
MD-11ER	338	4,500	338	338	338	338	6,800
B-747-100	394	2,900	394	394	365	313	6,600
B-747-200	365	3,800	365	365	365	365	7,600
B-747-400	295	6,250	295	295	295	295	8,650
B-767-200	149	2,450	149	145	120	98	7,500
B-767-200ER	161	3,650	161	161	161	161	7,700
B-767-300	186	3,375	186	186	186	167	6,800
B-767-300ER	213	3,500	213	213	213	213	7,200
B-767-400ER	232	3,500	232	232	232	232	6,500
B-777-200	250	4,200	250	250	250	250	9,200
B-777-200ER	263	5,515	263	263	263	263	9,500
L-1011-50	225	2,300	225	215	183	140	4,000
L-1011-100/ 150	230	2,900	230	230	220	174	4,400
L-1011-500	223	4,100	223	223	223	223	6,000

NOTE: **Troop weights are calculated at 400 pounds each, which includes personal equipment and field gear for combat operations.**